T H E S I S

on

S C A R L E T F E V E R

for the Degree of

DOCTOR OF MEDICINE

of the

UNIVERSITY OF EDINBURGH

by

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(M. B., C. M. Edin., 1890.)

HANDSWORTH,
Near Sheffield.
April, 1906.

SCARLET FEVER.

PROLOGUE.

In July 1904, a Joint Isolation Hospital for the three Rural Councils was opened in this district where I reside, and I was appointed Joint-Medical Officer to the same.

The area served by this hospital is of considerable extent, being about forty-five thousand acres; and the population is estimated to number about thirty-one or thirty-two thousand people. Shortly after my appointment, scarlet fever became epidemic throughout a great part of this district, and I have had exceptional opportunities of studying the disease in all its aspects, not only as regards benignity and malignity, but also as to its occurrence at different ages and in both sexes. I have, moreover, had ample facilities for watching the different complications which are apt to occur during the course of the disease.

The epidemic in question was of a very severe type, but, fortunately, the mortality was low. Some villages escaped altogether, whilst others had a very few cases; but the greatest number of those admitted came from the village nearest to the town of Rotherham, and I noticed that not only nearly all the worst cases came from there, but four out of the five deaths occured in patients from houses in the same street in that village.

Scarlet fever has been very prevalent for some time past in the city of Sheffield, and although Handsworth (the village where I reside) is quite close to it, there have only been two cases, at some distance from each other. These were removed to the hospital within a few hours of being diagnosed, and to this early removal I attribute the prevention of a wide-spread epidemic.

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N O M E N C L A T U R E.

Scarlatina - Febris rubra (Heberden) - Morbilli confluentes (Morton) - Scarlatine (French) - Fièvre rouge (French) - Scharlach, Scharlachfieber (German) - Febbre Rossa, Febbre scarlattina (Italian) - Escarlatina (Spanish) - Skarlagensfeber (Danish and Norwegian) - Scharlakenkoorts (Dutch).

D E F I N I T I O N.

Scarlet fever is an acute infectious disease, probably dependent upon some micro-organism, and characterised by the appearance, on the second day of the illness, of a bright scarlet punctiform rash, diffused over the greater part of the body. It is usually preceded by high fever (of sudden onset), vomiting and sore-throat, - followed by more or less general desquamation, and frequently accompanied by changes in the kidneys, joints, ears, glands, and serous membranes.

No other eruptive fever shows such a great variation in type as scarlet fever. Sometimes we see a very mild outbreak, - so mild, indeed, that the diagnosis is frequently a matter of the greatest difficulty, - whilst, at others, the disease assumes such a malignant form that death occurs in a few hours. Between these two, we see such variety as to make classification into groups well nigh impossible.

The following clinical classification seems to me as accurate and convenient as any hitherto attempted:

1. Simple Scarlet Fever - Scarlatina Simplex, or Scarlatina Benigna.
2. Septic Scarlet Fever - Scarlatina Anginosa, or Scarlatina Ulcerosa.
3. Toxic Scarlet Fever - Scarlatina Maligna, Ataxic or Adynamic Scarlet Fever.
4. Irregular Forms of Scarlet Fever - e.g. Scarlatina sine Eruptione, or Scarlatina sine Angina.

HISTORY AND GEOGRAPHY.

Although scarlet fever was only differentiated by Sydenham in the seventeenth century, there is no doubt that it had existed for a considerable period of time, and had been described under various names. Collie thinks it existed in the time of Hippocrates, and there is every reason to believe that it prevailed in Arabia, as in a translation from Haly Abbas, mention is made of the redness of the face and extremities, difficulty of swallowing, inflammation in the nose, etc.

Ingrassias of Palermo studied an epidemic at Naples in the middle of the sixteenth century. He noticed that the disease occurred in children before puberty, and was limited to the epidermis, which was of a reddish colour. It invaded the whole surface, and was accompanied by fever. He also noticed that it seldom recurred in the same individual; and, whilst drawing attention to its differences from measles, called it "rossalia". Coyttar of Poitiers also observed a similar epidemic in France about the same time; and, a little later, Baillou described an epidemic which occurred in Paris. He thought it resembled erysipelas, and called it "rubiolae". He also differentiated it from measles and smallpox.

Soon afterwards, an epidemic was observed in Spain by Mercado of Toledo, - physician to King Philip II. The disease was supposed to have been brought from Asia, and he described the patient as being suddenly seized with fever, headache, and retching. An intense redness appeared on the face and throat, extended upwards to the eyes, and then over the neck and trunk. It was symmetrical in distribution, and accompanied by high fever, and the skin was slightly swollen. He also noted that the rash was not that of erysipelas.

The disease was also mentioned by several other Spanish physicians, and called "garrotillo".

The disease appeared in various parts of Europe in the seventeenth century. It was very prevalent in Sicily, Malta, Rome, and Naples, from 1610 to 1620, and many names were given to it- e.g., "ulcera anginosa", "angina purpurum", "ignis sacer", etc.

Nola of Naples observed an erysipelatous redness of the pharynx, tonsils, and tongue, with difficulty in swallowing. There was also redness of the neck and face, accompanied by violent fever, and death frequently took place on the sixth or seventh day of the illness, sometimes even on the first. He also noticed its sudden onset, its contagiousness, and its prevalence amongst children - although it sometimes occurred in adults. He thought it to be more severe in girls than in boys.

About the same time it was observed by Dŏring in Poland; and, a little later, Sennert described an epidemic which occurred at Wittenberg. He gave an excellent description of the rash, and noticed, not only the desquamation, but also the liability to the occurrence of rheumatism. He likewise remarked upon its prevalence amongst infants, and preferred to call it "morbilli", although he differentiated it from measles and smallpox.

The disease was also observed later by Winsler of Brieg, in Schlesien, and also in Saxony by Fehr.

From 1661 to 1675 it existed in London, and Sydenham differentiated it from measles, erysipelas, and (probably) diphtheria. It was he who gave the name "scarlet fever"; but it is remarkable that he looked upon it as a mild disease, and made no mention of the sore-throat.

Morton, a physician of the seventeenth century, although aware of Sydenham's description, looked upon it as being identical with measles; and, a century later, Withering, having written an account of "The Scarlet Fever and Sore-throat, or Scarlatina Anginosa, etc.", was given the credit for distinguishing between it and measles.

Scarlet Fever never completely disappears from Europe, but breaks out from time to time at irregular intervals. It first appeared in North America in 1735, but not until a century later was it noticed in South America, New Zealand, Tasmania, Australia, Greenland, and Iceland.

Although sporadic cases occur (due to importation) in India, China and Japan, Egypt, Central Africa and Asia (with the exception of Asia Minor), it is unknown in epidemic form. In Asia Minor the disease assumes a very malignant type. It does not appear to be very prevalent in Australia, at any rate, epidemics there do not assume large proportions

BACTERIOLOGY.

Although as yet not isolated, there is every reason to believe that the specific cause of scarlet fever is some micro-organism. As long ago as 1869, Hallier (Jahr. f. Kinderh., N. F., ii, 1868-1869) examined the glands, the sweat, the scales of desquamation, the blood, and the urine of scarlatinous patients, and found a micrococcus adhering to, or within, the corpuscles of the blood. Various other investigators at different times found organisms which they believed to be pathognomonic, but nothing resulted from these discoveries.

In 1885, Klein (Local Gov. Board, London, Rep. xv, 1885-86) published the result of his investigations on the cause of scarlet fever. In that year an epidemic occurred in Marylebone, which was found by Blyth to be limited to those who had obtained milk at a certain dairy at Hendon. It was further shown by Power, that only those were affected who had partaken of the milk of certain cows, and on examination, these cows were found to be suffering from ulcers on the teats and udders. In other parts of London, cases of scarlet fever were traced to the milk from these affected cows. From the blood and tissues of persons suffering from scarlet fever, Klein isolated a streptococcus, which stained with fuchsin, gentian violet, and methyl blue; and to this he gave the name "streptococcus scarlatinae". He also isolated an identical organism from the sores on the udders and teats, and diseased viscera in the affected cows. He inoculated cattle and rodents with the streptococcus obtained from persons suffering from scarlet fever, and produced lesions resembling those found in the human disease. Moreover, he recovered the organism again, and cultivated it, and injected it into other animals, and produced the same disease. It was also proved that the affected cows could transmit the disease to healthy cows, and inoculation with the secretions from the ulcers produced similar ulcers upon the teats of cows inoculated. As a result of his experiments, Klein came to the conclusion that the disease in cows was "Bovine Scarlatina", and that the

streptococcus was the specific cause of the disease.

Many bacteriologists, - amongst others Thin and Crookshank, - were of the opinion that the streptococcus scarlatinae was identical with the streptococcus pyogenes.

Klein, whilst admitting their similarity under cultivation, maintained that they could be distinguished, and when inoculated produced totally different lesions.

Thin (Brit. Med. Jour., ii, 1887) thought the disease in cows was cowpox, and Crookshank (Lancet, 1887-88) published the result of his investigations on a similar disease occurring in a dairy in Wiltshire. It was observed that no cases of scarlet fever occurred in those who had taken milk from these cows, and he also maintained that cows are absolutely immune to scarlet fever.

C. B. Brown (Privy Council Office, Dept. of Agric., 1888) showed that the same disease at Hendon existed in may other dairies from which scarlet fever was not spread by the milk.

In 1887, Jamieson and Edington (Brit. Med. Jour., 1887, and Edin. Med. Jour., Nov. and Dec. 1887), of Edinburgh, published the results of their investigations. After taking suitable antiseptic precautions, they examined the blood and the scales of desquamation of scarlet fever, and found many micro-organisms, amongst others, the streptococcus rubiginosus, and the bacillus scarlatinae; the latter they thought to be the specific cause. They inoculated rabbits and guinea-pigs, and the inoculation was followed by a rise of temperature, rash, and desquamation. The bacillus, which was found in the blood, was motile, and could be cultivated on milk or bouillon.

A committee was appointed by the Medico-Chirurgical Society of Edinburgh to investigate, and they reported that the bacillus scarlatinae was only found in three cases out of ten, and that inoculation into animals gave negative results.

Shortly afterwards, Duclaux showed that Jamieson and Edington had not taken sufficient antiseptic precautions, and consequently their conclusions were not reliable.

In 1893, Dowson (Med. Chronicle, 1893-4, xix, 217) reported that he had found the streptococcus in the affected tonsils in scarlet fever, and Lemoine (Gaz. de Hôp. de Paris, Nov 25, 1895, p. 1337) maintained that the organism was found in the throat.

Behla (Centralbl. f. Bakt., Bd. 21, p. 777) observed a scarlatinal rash in hogs belonging to a family, some of the members of which were suffering from scarlet fever. He injected blood from a child suffering from the disease into a healthy pig, and observed a similar rash. He also noticed desquamation of the skin around the inoculation wound.

Class (N. Y. Med. Rec., Sept., 1899, p. 330) reported that he had found an organism which he thought to be the cause of scarlet fever. It is frequently of large size, not capsulated, and is a diplococcus, though it occasionally may appear as a streptococcus. He further stated that this organism could always be cultivated from the pharynx, not so frequently from the skin. It could also be cultivated from the blood, but not after the first day. The organism was also found in 3 out of 23 cultures from the normal skin, and in 8 out of 36 from the normal pharaynx, but could not be cultivated from the blood of healthy individuals. Class inoculated this organism into swine, and produced a disease closely resembling human scarlet fever. Post-mortem, the pigs showed diseased kidneys; and from these cultures were taken, which showed the diplococcus.

Baginsky and Sommerfield (Berl. klin. Woch., No. 22, 1900, p. 588) have also found a strepto-diplococcus in the blood and pharynx of scarlatinal patients, which bears a close resemblance to the diplococcus of Class.

Class' diplococcus is not motile, and has no spores, flagella, or capsule. It stains with ordinary solutions but not by Gram's method.

Cultivation. - The organism grows best upon glycerine agar-agar, to which is added 5 per cent by weight of black garden earth, rendered sterile by discontinuous heating. The garden earth is thoroughly dried, reduced to a fine powder by sifting through a fine sieve, and all particles of sand, etc., are removed. A thin paste is

formed by adding thin bouillon, this is boiled for an hour, and sterile bouillon is added from time to time to replace that lost by evaporation by boiling. It is put aside in a warm place, so as to allow any spores it contains to develop. It is again boiled for an hour, and then put aside, and the process repeated until no growth can be developed. This is then added to the glycerine agar-agar, the mixture is boiled for about half an hour, and then set aside for a time,and then sterilised. Scales from a scarlet fever patient are then placed upon this medium by means of a sterile platinum loop, and after incubating for from one to seven days, at a temperature of 35°C., small whitish-gray,translucent colonies appear about the scales and along the line of inoculation. These colonies though isolated at first, afterwards coalesce. Their diameter is usually about one millimetre. The colony is glutinous.

Class' observations have been confirmed more or less by Gradwohl (Phila. Med. Jour., Mar. 24, 1900, p. 688) Page (Jour. Boston SOC. Med. Sci., June 20, 1899), and also by Jaques (Bull. North-Western Univ. Med. School, Mar. 31, 1900, p. 284).

Serum Therapy.

Class obtained a toxic substance from the bouillon filtrates of the coccus, and gave four injections of 1, 2, 3, and 5 c.c. respectively, between December 16th, 1899, and February 6th, 1900, to a pig weighing 25 pounds. On February 20th, 1900, the animal was bled and the serum separated, and found to afford slight protection to guinea-pigs.

Dr M. Gordon has constantly found a streptococcus scarlatinae in the mucous secretion of the tonsils and fauces, and occasionally in the nasal discharge of patients suffering from scarlet fever. He has also obtained pure cultures from a serous effusion occurring during the course of the disease. He has not found it in the aural discharges, and never in an inflamed non-scarlatinal throat. He also states that the organism may be found in the throat long after the origin of the attack, - a point of great importance with regard to infection. Cultures may be obtained from the blood and tissues of fatal cases of scarlet fever, but the organism is apt to become modified

in these cases, and to resemble more the streptococcus pyogenes; but at the same time certain differences remain by which the two can be distinguished.

Mallory (Jour. Med. Research, Jan., 1904, x, p.483) has found protozoon-like bodies in the tongue of one case, and in the skin of three cases dying during the eruptive stage of scarlet fever. He also examined six other cases dying at an early stage, and several which died during the desquamative stage - but with negative results. He also examined the faucial, lachrymal, and nasal discharges, but the result was again negative.

C. W. Field (Proc. N. Y. Path. Soc., Mar., 1904) found the same bodies as Mallory, after hardening in Zenker's fluid, and staining with methylene blue and eosine, in the skin of five persons who had died during the course of the disease. He also examinied sections of skin taken from patients during life, but with no definite result.

Goodall (Med. Annual, 1905) thinks that these bodies have nothing to do with scarlet fever, and ventures the opinion that the specific organism will be found in the nasal discharge.

Hasenkopf and Salge (Jahr. f. Kinderh., lix), whilst not admitting that the streptoococcus scarlatinae is the cause of the disease, think that it stands in close biological relation to the scarlatinal patient. They found that the streptococcus scarlatinae was agglutinated by the serum of patients suffering from scarlet fever, but the serum lost this property towards the end of convalescence. Most of the other varieties of streptococci were not agglutinated by the scarlatinal serum. The streptococcus scarlatinae was not agglutinated by the serum of a healthy person, nor by the serums taken from patients suffering from other diseases due to streptococci.

Dopter (Soc. de Biol., May 14, 1904) denies that the streptococcus scarlatinae is the cause of scarlet fever, as he has found that the serum of scarlatinal patients not only agglutinates the streptococci of that disease, but also of erysipelas, septicaemia, and vice-versa.

Again, Jochman (Deut. Arch. f. klin. Med., Vol 78, ii, 3,& 4.) finds most fatal cases of scarlet fever in children dying during the disease to be due to a general streptococcic infection. He also found streptococci in the circulation of many of his cases before, and, in nearly all, after death. Therefore, he has come to the conclusion that, whilst the streptococcus scarlatinae plays an important part in the disease, it is not to be regarded as the specific cause.

A chemical substance, of a poisonous nature, named "scarlatinine", has been extracted from the urine of scarlet fever patients. It appears to be a product of the scarlatinal process, and is rendered inert by oxidation.

ETIOLOGY.

MODE OF ORIGIN.

The earlier physicians maintained that scarlet fever originated spontaneously; whilst, at a later period it was thought to be due to some miasmatic influence - i.e., peculiar changes occurring in the earth and in the air, which were able to predispose to, and cause the disease. Others, whilst acknowledging its contagiousness, were of opinion that it might arise "de novo", - in fact, they thought the origin of the first case could not be explained in any other way. These views were held until bacteriology had become a definite and practical science, when most investigators came to the conclusion that it could only occur from contagion, either mediate or intermediate.

Gerhardt (Sect. on Diseases of Children, XLVIII Cong. of German Naturalists and Physicians, 1875) considered whether scarlet fever is not a group of diseases rather than a single disease.

CLIMATE.

It is impossible to determine the influence of climate upon the scarlatinal poison; certain countries enjoy immunity, but is this to be ascribed to the climate, or to insusceptibility on the part of the inhabitants ?

Scarlet fever is more or less prevalent in epidemic form throughout temperate regions, but in tropical and sub-tropical countries it never assumes anything approaching an epidemic form, though a few isolated cases may occur.

It is much more prevalent in the northern states of North America than in South California and the southern states; but repeated outbreaks occur in parts of Europe and South America where the climatic conditions are practically the same as in the southern states of North America and South California.

Henoch (p.129) thinks there must be some condition of the atmosphere or climate which influences the spread of scarlet fever, as he has noticed that certain groups of years have been marked by wide-spread epidemics throughout distantly separated countries.

SEASON.

Observers agree that scarlet fever is more prevalent in the autumn months, from the middle of September to the middle of October or November. This was noticed by Sydenham. In England the maximum number of cases is usually reached about the end of October or the beginning of November, after which there is a steady fall, until the minimum is reached in March or April. In New York, according to Whitelegge, scarlet fever is more prevalent in the spring, and least so in the autumn.

Hirsch (Vi Jahr., Vol. 17, p.131) from the records of 435 epidemics, found that in a given number of epidemics

29.5 per cent occurred during the autumn months.
24.7 " " " " " winter "
21.8 " " " " " spring "
24.0 " " " " " summer "

He also states that its severity is greatest during the summer and winter months,- a statement which is not in accordance with the views of English observers.

Table of 231 Cases of Scarlet Fever admitted into the Swallownest Isolation Hospital.

1904.	July	3
	August	4
	September	22
	October	31
	November	14
	December	45
1905	January	16
	February	11
	March	12
	April	6
	May	12
	June	8
	July	11
	August	15
	September	21
		231

It will be seen from the above table that only 14 cases were admitted during November, but this was due to the want of accomodation, and not to the cessation of the epidemic.

On referring to the register of admissions, I find that the majority of cases admitted in December were in the first half of the month, and as many showed signs of copious desquamation upon admission, they ought really to be included as occurring during the previous month. The preceeding table practically agrees with the experience of others that the disease begins to be more prevalent during September, and increases up to November.

Although nothing as yet has been established, one would naturally think that changes of temperature, moistness of the atmosphere, etc., would have something to do with the prevalence of scarlet fever during the autumn months.

SOIL.

This appears to have no influence per se. According to Forchheimer, the mortality in Berlin from 1876 to 1883 was less amongst those occupying the lower floors than amongst those occupying the upper floors of the same tenements. It was greatest on the fourth floor, although the air supply was better there.

LOCALITY.

Locality must have some influence, or why does the disease spread in certain places, whilst it is absent in others? There must be some peculiarity in those districts to account for this immunity. Again, it is more prevalent in towns than in villages, and certain cities are much more affected than others - e.g., London suffers much more than Paris. As they have much the same climatic influences it is only reasonable to suppose the local conditions must play some important part. Various localities with the same climatic conditions are affected differently - e.g., South California is almost immune, whereas places in Europe with practically the same climate show a great number of cases, often with a high mortality. Therefore, we cannot help thinking that local conditions must exert a

great influence on the disease.

AGE.

The disease may occur at any age, but, as a rule, it is more prevalent and more severe in childhood. Children suffer more than adults, because from its frequent prevalence and highly infectious nature, the great majority of children are exposed to its influence during the first few years of life, contract it, and acquire protection. It seldom occurs during the first year of life, but increases from the second to the fifth or sixth year, after which the susceptibility annually decreases.

Dr Whitelegge emphasises the importance of saving young children from attacks of scarlet fever. He says: "In shielding a child against infection during the first few years of life there is a double gain; every year of escape from scarlet fever renders him less and less susceptible, until finally he becomes almost insusceptible; and, secondly, even if he should ultimately take the disease, every year that the attack is deferred reduces the danger to life which it brings. In other words, attacks of scarlet fever become both less severe and less frequent with every year of age after the fifth. Up to the fifth year the liability is less (than in the fifth year), but the risk of life in case of attack is very great".

Murchison's Table of the Numbers Affected at Different Ages per 1000.

Age - years:	0-1.	1-2.	2-3.	3-4.	4-5.	5-10.	10-15.
Numbers:	67	141	160	151	119	259	56

Hoff's figures, covering an outbreak at Thorshaven, show that out of 343 inhabitants between the ages of 0 and 20 years, 193 (or 56 per cent) contracted scarlet fever. Out of 582 inhabitants over the age of 20 years, 44 (or 7.6 per cent) developed the disease. These figures are valuable as they concern a population where there had not been, as far as could be ascertained, a previous epidemic.

Table of 231 Cases of Scarlet Fever admitted into the Swallownest Hospital.

	Male.		Female.		Total.	
	Admitted.	Died.	Admitted.	Died.	Admitted.	Died.
Under 1 year	0		0		0	
1-2 years	5		2		7	
2-3 "	8		18		26	
3-4 "	10		5		15	
4-5 "	6		12		18	
5-6 "	11		7		18	
6-7 "	7	1	8		15	1
7-8 "	13		13		26	
8-9 "	14		17	1	31	1
9-10 "	16		13		29	
10-11 "	5		6	1	11	1
11-12 "	4		3		7	
12-13 "	5	1	5		10	1
13-14 "	1		2		3	
14-15 "	3		1		4	
15-16 "	-		-		-	
16-17 "	1		-		1	
17-18 "	1	1	-		1	1
18-19 "	-		2		2	
19-20 "	-		-		-	
20-25 "	1		2		3	
25-30 "	-		2		2	
30-35 "	1		-		1	
35-40 "	1		-		1	
	113	3	118	2	231	5

Out of 231 cases admitted -

84 occurred in children under six years.

136 " " " over 6 and under 16 years.

No case occurred in a child under 1 year.

The above table shows a higher percentage of cases than usual occurring over 6 years of age. The greatest number admitted were between the ages of 2 and 10 years, - greatest in the ninth year. After the fifteenth year the cases were few.

SEX.

Although V. Jürgensen (Nothnagel's Ency. of Prac. Med., p. 401) thinks that sex plays no important part, most writers state that females are slightly more liable than males, especially over the age of 15 years.

The tables of the Metropolitan Asylums Board show an increase of females over males, especially over 5 years of age.

According to Murchison:

	Males.	Females.
Below 5 years	51	49
5-10 "	about equal	
15-55 "	46	54

Perhaps the fact of females nursing the sick may account for the increased occurrence after the age of 15 years.

Swallownest Table.

	Males.	Females.
Below 5 years	29	37
5-10 "	61	58
10-15 "	18	17
15-40 "	5	6

MORTALITY.

The mortality of scarlet fever varies in different epidemics from 2 to 30 per cent. As a rule, it is greater in males than in females, and is slight over 15 years of age. According to authorities, it is most fatal in early childhood; greatest in the first year of life, - some say in the third year, - after which there is a diminution to puberty. From puberty to 25 years of age it remains at its lowest, after which there is a slight rise.

The mortality is much higher in those who are debilitated from any disease - e.g., phthisis, pulmonalis, and other tuberculous affections, renal disease, parturition, surgical operations, etc. It is also higher in the poor than in the rich, though sometimes the latter show a peculiar susceptibility to contract the disease in a very fatal form.

The mildness of the epidemic is no guide as to the fatality, as sometimes less care is taken of those who are suffering from a mild attack, and consequently they are apt to contract nephritis, etc., and cause a high death-rate.

The mortality is higher in towns than in the country, and in hospitals than in private practice. This is due to the worst cases being sent into hospital for treatment.

Some cities - e.g., Berlin and London, show a higher mortality than others - e.g., Paris,

Statistics show the rate of mortality to be gradually decreasing, and this is due in great part to the provision of isolation hospitals, and to the lessened virulence of the disease, although at any time it may again assume a very malignant tendency.

According to the Metropolitan Asylums Board's tables for the years 1890 to 1894, the mortality was about 5 per cent; and, for the last 23 years, the combined mortality was 8 per cent; but the annual percentage mortality since 1874 has fallen steadily from 12.2 per cent to 5.9 per cent.

Johannesen has classified 8,608 deaths from scarlet fever, occurring in Norway between the years 1867 and 1878, as follows:

24.1 per cent occurred during September, October and November.
31.2 " " " " December, January and February.
24.7 " " " " March, April and May.
19.8 " " " " June, July and August.

In the Swallownest Hospital the mortality was 2.1 per cent., and was greater in males than in females.

RACE.

In the Medical and Surgical History of the American Rebellion (Vol. 3, part 1,) it is stated that amongst the soldiers scarlet fever occurred oftener, and was attended with a higher mortality in whites than in blacks. Hirsch quotes Frich of Baltimore, who gave the proportion occurring in that city as 13.8 per cent of whites, and 10.8 per cent of coloured people. In Cincinnati, during eighteen years, out of 2,764 deaths from scarlet fever, only 11 were in coloured people.

From these tables it seems that, although the blacks are not so often attacked as the whites, the death-rate is out of all proportion in the latter. It is also stated that creoles suffer more from this disease than the whites.

STATION IN LIFE.

As a rule, the poor are affected more than the rich, although some authorities - e.g., V. Jürgensen, maintain that both classes suffer equally. There is no doubt that the rich and poor are equally liable to contract it when exposed to the infection, but the former, owing to their surroundings, are not so likely to be exposed as the latter.

One would naturally come to the conclusion that poverty, dirt, and malnutrition, over-crowding, and badly ventilated rooms, and bad nursing would all tend to cause an increased frequency of the disease; although, at the same time, there is no doubt that early removal to an isolation hospital tends to greatly diminish the mortality amongst the poor. On the other hand, those who are able to live in affluence and under the best possible hygienic surroundings, would be thought to have a better chance of recovery, as its severity might be mitigated, but sometimes these do not avail, especially in certain persons who seem to be predisposed to contract it in a very severe or even fatal form.

Poverty and insanitation can have no influence per se in originating an outbreak; and, according to Forchheimer, the poor show a lower death-rate. He found, in Berlin, that the mortality was lower in the back part of the tenements than in the front where the rents were higher.

INDIVIDUAL PREDISPOSITION (IDIOSYNCRASY).

There is no doubt that the predisposition to scarlet fever is much less than in measles, whooping-cough, or smallpox. Some persons are so susceptible to the poison that they contract the disease whenever exposed; and, although showing no rash, suffer from sore-throat, and malaise.

These cases are apt to be unnoticed, and so frequently spread the disease. On the other hand, some avoid it for years, then acquire it - very frequently in fatal form; this is very often seen in medical men.

The disease varies greatly in character; sometimes it is so very slight that the patient does not feel ill, and is able to go about as usual. At other times it is so virulent that it causes death in a few hours. Previous illness lowers the vitality of a person, and so renders him more liable to take the disease.

In most epidemics we notice some, although exposed very much, fail to contract it, - though they may be the means of spreading it. This is very noticeable in some families. In other cases some suffer veryslightly; whilst, in others, the disease is so severe that many complications occur, and even death results.

Families show different peculiarities: in some, nearly all who are affected die. Three brothers were brought into the Swallownest Hospital: the second, aged 14 years; had an ordinary attack without any complications; the youngest, aged 12 years, showed the malignant type, and died 24 hours after admission; whilst the eldest, aged 18 years, had the septic form of the disease, with the formation of abscesses, and died suddenly during the seventh week of the illness.

The predisposition to scarlet fever varies in different localities - e.g., in the epidemic in the Faroe Islands, it was noticed that, in one small village with a scattered population, there were 36 per cent of cases. In another, where the population was crowded, the percentage

of those affected was only 6, although the conditions of soil, temperature, and climate were the same.

IMMUNITY.

As a rule, one attack protects against subsequent infection; but sometimes we hear of a second, and even third and fourth attacks, - though perhaps in some of these cases the diagnosis was obscure. A second attack in scarlet fever is not so common as in measles.

Before we could definitely pronounce a case to be a second attack, we must be sure that it is not a relapse; and it must occur at such a period after the first that it can have no connection with it. I have lately seen in my practice a second attack in a girl of 8 years, who four years previously had a typical attack of scarlet fever. Henoch (p. 683) states that he has only seen one authentic case of a second attack of scarlet fever, although Murchison has recorded a third, and Stiebel a fourth attack. Korner (Graves and Gerhardt: Syst. of Clin. Med., p. 421) states that the second attack usually occurs before the age of 10 years, and follows from 2 to 6 years after the first. W. A. Dunckel (Arch. of Ped., 1904) observed a second attack of scarlet fever within eight months of the first - in a child of three years. Dukes thinks that second attacks of scarlet fever are really attacks of the so-called fourth disease.

SURGICAL SCARLATINA.

For a long time it has been noticed that persons suffering from wounds- either accidental or operative - have been liable to attacks of scarlet fever, and many cases have been recorded as such, although they did not show the typical symptoms or present any of the sequelae.

Before we are justified in diagnosing this disease, the patient must not only show a typical scarlatinal rash, but at least one of the other symptoms - e.g., sore-throat, enlarged glands, desquamation, or one or other of the sequelae.

Hoffa (Volkmann's Samml. klin. Vort., No. 292; Chirurgie, No. 90, 1886-87, pp. 2679 et seq.) states that before you can diagnose surgical scarlatina with absolute certainty, you must have eliminated:

1. Erythema congestivum.- This occurs after operations on parts richly supplied with nerves, and is due, partly to vasomotor nerves, and partly to reflex action. The rash soon disappears and there is no desquamation.

2. Erythema toxicum.- This is supposed to be due to the absorption of the secretions from the wound, or of the poison from the injured tissues; and some have thought that the fibrin ferment is the poison in question. There is high fever, delirium, and gastric disturbance; and the rash, which appears on the trunk and limbs, usually lasts about 24 hours, and is not followed by desquamation. This erythema is also due to the action of certain drugs.

3. Septic rashes.-

Hoffa also maintains that scarlet fever can originate from wounds, and cites the case of V. Leube, who though often exposed to scarlet fever in his practice, did not contract it until he wounded his finger in making a post-mortem examination of a patient who had died from the disease. The rash, which spread up the arm from the wound along the lymphatics, was preceeded by vomiting and fever, and rapidly spread over the rest of the body. Desquamation began on the arm with the injured finger.

The cases reported by Paget (Brit. Med. Jour., 1864, ii, p. 237) were supposed by him to have been infected before operation, and he attributed the disease to an alteration produced in the nervous system by the injury itself, or to the inflammatory process as a result of the injury. He also thought that sudden deaths on the second or third day after the operations may have been due to undeveloped scarlet fever.

Hoffa also agrees with other authorities that, although the injured person may not be more liable to the disease, the injury (i.e., the accidental or operative wound) acts as a depressant to the system, and the

lowered vitality tending to lessen the resistance of the body to the scarlatinal poison, allows the organism to develope.

Howse, as a result of his investigations, came to the conclusion that the antiseptic treatment is a perfect protection against scarlet fever occurring from the wound.

Henoch (p. 682) has noted the great susceptibility of children to surgical scarlatina, who have been the subjects of operations for phimosis and tracheotomy, and who are suffering from wounds about the eyes; and Hagenbach (p. 113) states he has observed that patients with tracheotomy wounds show an increased susceptibility to the disease; and in these cases the period of incubation was very short.

Bruner (Berl. klin. Woch., 1895, No. 22, pp. 469 et seq.) mentions five cases where scarlatina developed after a local post-operative erysipelas.

Alice Hamilton (Amer. Jour. Med. Sci., July, 1904) states that, after a study of the reports of cases of so-called surgical scarlatina appearing in various journals at different times, there is nothing special about this form of the disease; it is simply scarlet fever occurring in patients who are the subject of wounds.

The prognosis in surgical scarlet fever is very grave.

Caiger (Allbutt's Syst. of Med., Vol. 11, pp. 145, 146) considers surgical scarlet fever to be a very mild disease. On account of the injury, the patient is so susceptible to the scarlatinal poison that a minimum dose will react - a dose so small as would have no effect on a healthy individual. He also says that the same mildness is observed when the disease occurs in patients who are the subjects of various medical ailments.

PUERPERAL SCARLATINA.

Women during the puerperium are also very liable to infection with the scarlatinal poison; and, here again, it is necessary to distinguish true scarlet fever from septicaemia occurring in the puerperal patient.

Braxton Hicks has published 87 puerperal cases in which there was fever, and came to the conclusion that 37 were scarlatina, although 17 had no rash, and only slight sore-throat.

Von Jürgensen (p. 23), whilst questioning the accuracy of the diagnosis in Braxton Hicks' cases, thinks English women are much more liable to the disease than German; and Runge (Lehrb. de Geburtsh., p. 564), whilst stating that scarlet fever occasionally complicates the puerperal state, regards it as occurring chiefly in England,- although isolated cases, and even epidemics, have been observed in Germany and Switzerland.

Before establishing a diagnosis of puerperal scarlet fever, we should take the precaution of eliminating the rashes mentioned by Hoffa, as detailed in the section on surgical scarlatina, and insist on the typical symptoms being present. According to Henoch (p.682), the liability of puerperal women to contract scarlet fever is due to the weakened resistance of the individual, and, in addition, to the existence of a large surface admitting of the ready absorption of the poison.

As a rule, the infection occurs shortly after labour, although it may take place during pregnancy; and the disease runs its ordinary course, - but it has been remarked that the intestinal symptoms are more pronounced, and that the throat affection is apt to be milder. Moreover, the prognosis is very bad.

I have seen one case of puerperal scarlet fever in my own practice, about eight or nine years ago. I attended a young woman during her first labour, which had to be terminated by the forceps; and, four days afterwards, a rise of temperature was noticed, with vomiting and sore-throat. Next day she had a typical scarlatinal rash, followed by desquamation over the greater part of the body. The disease ran an ordinary course, there were no complications, and she was allowed out of quarantine in eight weeks. The child did not develope the disease. On enquiry I found that about three months before the woman was confined her sister had scarlet fever, and had been

isolated in the room where the woman was delivered. (The room was supposed to have been disinfected, but this was doubtful). However, after the case had recovered, the local sanitary inspector attended to the disinfection, and about a year afterwards I attended the mother of the woman in her confinement in the same room, and she had an attack of puerperal septicaemia, but there was no rash, and no desquamation.

Sometimes scarlet fever occurs during or shortly after other infectious diseases - e.g., chickenpox, measles, and smallpox. It has also been observed after erysipelas and mumps; as a rule, it runs its normal course.

PECULIARITIES OF EPIDEMICS.

Epidemics of scarlet fever tend to occur every few years as a fresh series of susceptible children become exposed to the contagion, and their periodicity is well marked in certain districts, but less so than in the case of measles. As a rule, epidemics of the latter disease spread quickly, affect a large area, and soon die out; whereas scarlet fever spreads slowly, and lasts for a much longer period of time. It often hangs about a district in a sporadic form, and these cases are frequently the cause of small epidemics. Owing to its spreading so slowly, it can frequently be stamped out, if the first few cases are promptly isolated, and only those who were exposed before the isolation of the patient will develop the disease.

Scarlet fever shows a great variation as to mortality in different epidemics, even in the same district. At one time it is very mild, at another very severe.

Trousseau (p. 137) remarks that at a certain period his teacher Brettoneau regarded it as a mild affection, as he had not seen a death from it from 1799 to 1822; but a very severe epidemic, attended by a great mortality, breaking out in 1824 in Tours, caused him to modify his opinion.

It is impossible to explain the great variation seen in different epidemics, both as to mortality and severity of infection in individual cases, especially when occurring in the same family. This variation is greater than in any other disease, and is not apparently controlled by laws or any semblance of regularity.

Scarlet fever is usually milder at the end than at the beginning of an epidemic; and Whitelegge states that it is least fatal when most prevalent, and vice versa, because the larger the epidemic, the greater the number of mild cases.

We know nothing of the real origin of scarlet fever. In Europe and North America it is endemic at the present time; and, though it may occur sporadically, or even in small epidemics in other places, yet it has not made a permanent home there. It is always carried about from place to place, and yet it dies out in certain districts. What is the cause of this? Are the people immune? What prevents the disease from spreading? Why does the organism cease to develop? This is different to measles and smallpox; where they obtain a footing, there they remain. One is bound to come to the conclusion that there is some peculiarity in the scarlatinal poison.

In epidemics scarlet fever does not attack every person exposed to the contagion. Why ? We do not know. According to the statistics of Hoff regarding the epidemic occurring in the city of Thorshaven, only 38.3 per cent of the total population at all ages suffered from the disease and this in a place where none were protected by a previous attack, as up to that time there was no evidence of the disease having existed there previously. On the other hand, when in 1875 measles was epidemic in the same city, 418 out of 930 were protected by a previous attack, yet 506 were affected.

As a rule, epidemics of scarlet fever take a long time to spread. In the Faroe Islands (where it was thought to have been introduced from the Orkney Islands) it took 27 months to spread over the whole of the island.

AERIAL PROPAGATION OF THE DISEASE.

Although the contagion of scarlet fever is very active and very persistent, it is not easily diffusible. Forchheimer (p. 15) records a case where the children of one house talked through open windows to other children who were ill or convalescent from the disease, at a distance of only nine feet, and yet did not contract it. It has also been observed that isolation hospitals are not a source of infection for the neighbourhood. It appears from the Reports of the Boston City Hospital (1897, p. 7) there was no case of scarlet fever within one-eighth of a mile of the Infectious Hospital, and out of a total of 286 cases occurring within one mile,-

68 occurred within one-quarter mile.
71 " " one-half "
75 " " three-quarters of a mile.
72 " " one mile.

The report in question also showed that 757 cases were reported as occurring more than one mile from the hospital. I have also noticed that since the Swallownest Hospital has been opened there has been no case of scarlet fever reported in the nearest village, about one-quarter of a mile away.

CONTAGION.

The essential cause of scarlet fever is thought to be a micro-organism, which extends from case to case by direct infection, or indirectly is carried by doctors, nurses, or visitors, or by fomites contained in the room - e.g., furniture, bedding, clothing (may be spread from a laundry to which infected clothes have been sent), parcels, books, toys, letters, photographs, etc. Piano cases, violins, and articles put away in drawers, have all been the means of spreading the disease. It is not spread by water.

Von Kerschensteiner differentiates between

1. Objects that have been in close contact with the patient - e.g., his clothes, linen, bed, etc. These contain a great amount of poison, and can transmit it.

2. Persons who dust the clothes of others who have been in contact with the patient can be infected - e.g., the clothes cleaner of a doctor who has attended cases of this disease in an epidemic.

3. Visitors to see the patient.

Although it is doubtful whether dogs and cats suffer from scarlatina, it is said they are able to carry the infection. Caiger (Allbutt's System of Med., Vol.2, p 130) says he has never seen a cat communicate the disease. It is said to spread through the agency of flies and other insects.

The contagion, although much less volatile than that of measles, soon loses its virulence when diffused through the air. The bacillus is carried throughout the body by the circulating blood, and is present in the epidermic scales, throat, nasal and aural discharges, in the expired air, and probably in the urine and faeces.

In a great number of cases the spread can be traced to direct contagion (and in these there must have been very close contact with the patient), in others, indirectly, but in many instances, it is impossible to trace the source from which the poison was derived.

A very important question arises - can a pregnant woman suffering from scarlet fever infect the foetus ? We know this occurs in smallpox, and cases have been recorded of congenital scarlet fever; but, in these, the chances of infection immediately after birth have not been excluded. Thomas (p. 181) says it is difficult to decide the fact, as most children are born with a scarlet or yellowish-red tint of the skin, and very soon go through a normal desquamation. Cases are also recorded by Murchison where the mother had scarlet fever at delivery, but the foetus showed no signs of the infection.

Tortual records a case where a woman nursed her husband and son, who were ill from scarlet fever, up to near her confinement, and the child was born with the disease. The infant recovered.

How does the scarlatinal poison leave the patient, and how does it enter the healthy?

Von Jürgensen says the general opinion is that the dried and finely powdered particles of dust can be scattered through the atmosphere. How can it then escape from the moist cavities of the mouth and pharynx of the patient, and spread its way through the air? Lemoine thought the poison was contained very largely in the local lesions in the pharynx, and that the secretions from these were expelled during coughing, vomiting, etc., and scattered in the vicinity of the patient upon the skin, clothes, etc., whereon they dried. This, however, does not explain a mild attack, and also the cases in which infection occurs in an early stage before the pharyngeal lesions are well marked.

Many theories have been advanced as to how the poison finds its way into the body, but all are mere hypotheses. All we are justified in saying at present, is that, under certain conditions, it may enter through the respiratory or gastro-intestinal tract, or it may be absorbed through some breach of continuity in the skin or mucous membranes.

The scarlatinal poison is very tenacious and retains its contagious properties for an indefinite period. This tenacity seems to depend upon its own virulence, and not upon surrounding conditions. Murchison cites the case of a ward in St. Thomas' Hospital which was used solely for scarlet fever. After the epidemic had subsided, this ward was thoroughly disinfected, cleaned and painted, and although this was repeated yearly, every child sent into it for the next two years developed the disease.

Murchison also records the case of v. Hildebrand who, after visiting a case of scarlet fever, put his coat away for eighteen months. On wearing it again he contracted the disease.

Hatfield (Amer. Text-Book of Dis. of Children, p 157) relates a case where a garment, which had been exposed to infection and packed away in a box for 35 years, when brought out, infected a grandchild of the owner.

Sometimes the physician may be the means of conveying the infection, - although v. Kerschensteiner thinks that cases due to this cause are very rare.

Dr v. Essinger visited cases of scarlet fever in Mannheim, and in the afternoon of the same day, without changing his clothes, called upon Dr Loeb of Worms, whose daughter he nursed. In 48 hours she developed the disease. There were no other cases of scarlet fever in the town at that time.

Allbutt (Vol.2, p.129) mentions a case of doubly indirect infection:

"A father, staying in the house of a friend, met, on the platform of a railway station thirty miles away, his son who came to this station from a school in which scarlet fever was then prevalent. The two spent an hour and a half together, and then returned to their respective quarters. Within the next four days the lady of the house to which the father returned fell ill and died of malignant scarlet fever. The father and son remained well".

Cases discharged from an infectious hospital sometimes give the disease to others, - the so-called return cases. (These will be referred to again under treatment.)

I have notes of a case where scarlet fever occurred in a house five days after the return of a patient discharged from the Swallownest Hospital. The Medical Officer of Heath looked upon it as a return case, but on enquiry we found that the dress which the first patient wore the day before she was taken to the hospital, had been put away in a drawer and not disinfected. She wore it the day after her return home, and this no doubt was the cause of the attack in her sister.

MILK EPIDEMICS.

Milk is one of the most frequent causes of the spread of scarlet fever, and since Taylor in 1870 first called attention to this fact, many epidemics have been traced to it. Most observers think that it acts simply as the carrier of the infection, but a few - e.g., Klein, believe cows are liable to suffer from scarlatina, and infect the patient directly through it.

Most of the recorded epidemics due to the milk supply have occurred in England; and Hall (Med. Rec., 1899, Vol. 56) states that scarlet fever does not occur to any great extent in countries where cow's milk is not used as food, and where asses' or goats' milk is used it is unknown. If this be so, what can be the explanation why they do not carry the infection ? It has also been noticed that the disease does not occur in countries where the children are brought up on the mother's milk, and in Japan, where domestic animals are scarce, and cow's milk not much used, it is unknown.

It has been stated that no epidemic has been traced to the milk supply in America, but Freeman thinks this is due to the milk supply not being properly investigated. Moizzard (p.118) also states that no epidemic has been proved to be due to the milk in France.

Milk may become contaminated in different ways:

1. The cows may be milked by a person suffering from the disease, or attending upon a person who is suffering from it; or there may have been a mild case occurring in the milker's family, - showing only sore-throat and no rash, in fact so mild that it has escaped recognition.

2. The milk may have been kept in a room in which clothes or refuse matters from a scarlatinal patient are lying.

The disease is spread by unboiled milk, and the cream is said to be especially dangerous.

Freeman (Nothnagel's Ency., p. 414) states that, although there is no doubt that certain epidemics have been caused by contaminated milk, yet in no case has the particular organism causing the disease been demonstrated in a sample of milk. (This statement he also applies to typhoid fever and cholera, both of which are milk-borne diseases.) He sums up his conclusions as to the general characteristics of a milk epidemic as follows:

1. The cases appear suddenly; there are many new ones each day; and when the contaminated supply is stopped, they cease as quickly.

2. The cases are not restricted to a certain part of the town, but often occur in houses at a distance from each other.

3. The houses of the poor are apt to suffer less than those of the rich.

4. Those members of the family who are milk drinkers are the most liable to the infection. In an epidemic reported by Freeman, 78 percent of the special milk drinkers were affected, and only 27 per cent of those who were not special milk drinkers.

5. Those who have used the milk of a certain dairy are affected, whilst others escape.

6. In many instances it has been found there was disease among the milk dealers themselves or their families before the epidemic began. Freeman states that out of 26 recent epidemics, all occurring in England, contamination of the milk supply from a case of the disease in man was proved to have taken place in 15.

In the now historical outbreak of scarlet fever in Marylebone in 1885, the disease was traced to a certain dairy in Hendon. Upon investigation, this dairy was found to have excellent sanitary arrangements; and no case of scarlet fever was or had been in the neighbourhood for a considerable period of time. The epidemic began after the arrival of three newly purchased cows, one of which at the time presented vesicles on the teats and udder. This affection was not attended by any obvious signs of

illness, and did not affect the yield of milk, but it spread rapidly amongst the cows occupying certain sheds, from which the suspected milk was derived. It was also proved that this milk caused the disease; because a retail dealer supplied from the dairy suspected his milk to be infected, and returned it to the proprietor, who ordered it to be thrown away. Instead of doing so, the servants gave the condemned milk to certain poor persons living in the neighbourhood, and a week later there was a severe outbreak amongst the children of these people.

At Rostock (Germany) cases were distinctly traced to the milk. It appears that during the five months preceding the outbreak there had been only 28 cases of scarlet fever in the city, and these were all wide apart, but in the sixth month, 36 cases were notified, and all living near together. It was found that, with two or three exceptions, these bought their milk from a certain dairy in another village across the river. Upon investigation, it appeared that, without occurring in any other house in that village, six cases of scarlet fever and throat affections occurred in the family of the tenant and among the day workers on the farm. A number of these had attended to the milking and to the delivery of the milk to the customers. It was proved that 8 out of the 36 cases were certainly due to this milk, whilst of the other cases, a great number were affected from those who were first taken ill. Another point was that only those became ill who had drunk the milk without boiling, whereas those who had boiled it escaped, although living in the same house.

Tingvall (Hyd. Rundshau, 3, 1904) reports an epidemic of scarlet fever at Westeras, Sweden, due to infected milk. There were 22 cases in a city of 12,000 inhabitants. All of these took milk from one milkman, in whose family there was a case of the disease.

WHEN CONTAGIOUS.

Most observers consider scarlet fever to be contagious from the earliest symptom to the end of the desquamation, although different physicians hold different views as to when it is most so. Eichhorst (p. 230) says it is least infectious during the stage of incubation, most pronounced during the time of eruption, and diminishes towards the end of desquamation.

Osler does not think it is infectious during the stage of incubation or before the eruption appears, and considers the stage of desquamation to be the most dangerous; whilst Holt states that the infection is the most active during the febrile stage.

Sanné thinks it is most infectious during desquamation; but Lemoine (Bull. et Mem. Soc. Med. des Hôp. de Paris, 1895, iii, S. xii, p. 728) quotes cases going home during that stage and not spreading the disease.

Bond (Brit. Med. Jour., Feb., 1887) relates a case where the patient was sent out of hospital 15 days after desquamation had ceased. She was thoroughly disinfected, and although the parents were told to keep her apart, she slept with her sister, who developed scarlet fever five days after.

Wood (Therap. Gaz., Vol. 1, 1889, p. 739) had an identical case.

These observers do not say whether there was any aural or nasal discharge, or if the poison was in the pharynx. (Lemoine's theory)

Lauder, Medical Officer of Health for Southampton (Lancet, Mar. 12, 1904) considers that at the end of four weeks from the commencement of the illness, the desquamation is not infectious. In his opinion the nasal and aural discharges are the most important causes of infection; and both Millard and Aaser (Arch. Med., 1903, Abt. ii, A. 51) hold similar views.

Reference will again be made to Lauder's paper under treatment.

On the evening of June 15, 1905, I was asked to visit two children, - both girls aged 8 and 9 years respectively, - who had been taken suddenly ill. I found they had sore-throat and vomiting; and on the next day a typical scarlatinal rash appeared. On making enquiries, I found a younger sister, aged 5 years, had been discharged from the Sheffield City Fever Hospital on June 12, 1905, where she had been isolated for eight weeks for scarlet fever; and upon examination I detected that she was suffering from a copious nasal discharge. There is no doubt but that she infected the others.

PATHOLOGY.

So long as the specific micro-organism of scarlet fever remains obscure, so long shall we be unable, in the most cases at any rate, to determine with any degree of certainty, how much of the lesions found post-mortem are due to the scarlatinal poison, and how much to a mixed infection.

The macroscopic appearances at the autopsies of fatal cases of scarlet fever (though not striking, or constant), vary with the type of the attack, the stage at which death has taken place, and also as to the presence or absence of any complications.

As a rule, rigor mortis is well marked, and in toxic or septic cases, where cadaveric lividity usually appears before death, decomposition not only sets in early, but is very rapid. The blood in these cases is usually thin, dark in colour, and coagulates imperfectly. There is usually a great amount of staining of the walls of the vessels, and at the same time fine serous ecchymoses are very common.

The changes in the body in scarlet fever are of a two-fold nature; firstly, those due to the streptococcus scarlatinae, associated with those changes which are to be seen in the body in any acute febrile disease; and, secondly, those due to a mixed infection (the septic element), the result of the entrance of the streptococcus pyogenes albus or aureus (or other pyogenic micro-organisms), the pneumococcus, and probably other bacilli.

At the beginning we are face to face with a very difficult problem: Does the scarlatinal poison develop in the blood, or in the tissues, or in the organs ? We know that it develops in the throat, and there is also every probability of its multiplication in the blood as well; for, scarlet fever may exist without any eruption or sore-throat, and how can we explain on any other grounds those cases of malignant scarlet fever which are fatal,

if not before these symptoms appear, at any rate before there is time for the development of any of the secondary infections ?

From clinical experience we know that the septic organisms multiply in the throat, and no one will doubt that the tissues of the fauces may constitute a focus from which secondary infections of a suppurative nature may be derived, for we see a great improvement in the condition of the patient, when active and vigorous treatment is applied to the throat.

THE SKIN.

The exanthem which is so pathognomonic of the disease, disappears at death, except in a few cases where the inflammatory process had been unusually severe (in these only a slight reddening would remain), and also in those haemorrhagic forms, where there has been extravasation of blood leading to the formation of definite petechiae.

The essential changes in the skin are due to an active hyperaemia and oedema of the cutis vera. With this hyperaemia there is a transudation of leucocytes, and of a variable amount of blood pigment into the surrounding tissues. Accompanying these changes there is a rapid cell-proliferation in the rete Malpighii, which becomes very much thickened. There is also an effusion of serum between the cells of the epidermal layers just superficial to the rete mucosum, which leads to a weakening of their mutual cohesion, in consequence of which separation occurs at the points of effusion. This is best seen in those cases where the rash is most vesicular. As a result of the drying up of the fluid contents, the delicate investments soon rupture in the centre, leaving a series of pinholes, from which the peeling extends centrifugally. At the same time the hyperaemia causes a rapid cell-proliferation in the rete mucosum, and this quickly renews the shed epithelium.

The minute bright-red papular elevations are due to the intense dilatation and congestion, and although they are most marked about the hair follicles, they bear no relation to them. They no doubt correspond in position with the follicles, but the greater number are independent of them, besides being numerically in greater excess. According to Thomas (p. 212), they may be found over the surface of a cicatrix following a burn, and these are known to be destitute of hair follicles.

Different authorities hold different views as to the nature of this hyperaemia and oedema. Unna (Orth's Lehrb. de Spec. Path. Anat., 8th Edn., 1894, Vol. 2, pp. 629 et seq.) does not consider the process to be inflammatory. He maintains that when the eruption is at its height, there is a marked shrinking of the epidermis, whilst the blood vessels of the cutis and papillae are in a widely dilated state. These he believes to be the cause of the turgescence of the skin seen at this stage, and does not regard it as an actual oedema. He also maintains that there is an absence of any true inflammatory exudation of white corpuscles. Towards the end of the eruptive stage, and at the beginning of desquamation, collections of connective tissue cells are usually seen about the blood-vessels of the papillae. Plasma-cells are not formed, whilst mast-cells are first seen (at any rate in any large number) with the establishment of desquamation. The rete Malpighii does not show any marked early changes, mitosis occurring first during desquamation. He regards the entire process as a vasomotor disturbance, and not a true inflammation, and considers the development of oedema a co-existent condition of neurotoxic origin, and not due to the erythema.

According to Unna, every alteration occurring in the skin during the course of the disease is the result of the direct action of the specific scarlatinal virus.

Von Jürgensen (pp. 114 et seq.) agrees with Unna. He thinks that the alterations in the skin are due, not to an inflammatory process, but to the effect of the scarlatinal

poison, which produces a pure vasomotor paralysis of the peripheral vessels. He also considers the occurence of a true interstitial oedema of the cutis in scarlet fever to be the exception.

Ziegler (Lehrb. der Spec. Path., Vol 2, p. 416, Jena, 1895) describes the scarlatinal exanthem under the heading of inflammations of the skin, and as being characterised by a more or less extensive cellular exudation into the tissues.

Thomas considers the changes to be due (pp. 202 et seq.) to a hyperaemia and exudation into the rete Malpighii.

Kaposi (Path. u. Therap. der Hautkr., Berlin and Vienna, 1899, p. 243) considers the anatomical changes in the skin in normal forms to be due to hyperaemia with moderate exudation. He also thinks thepapillary and vesicular eruptions are the result of an excessive exudation and cell-proliferation in the papillae and rete Malpighii, whilst the petechial form is due to haemorrhagic effusion into the papillae and the cutis vera.

Hebra agrees in the main with Kaposi, and his views need not, therefore, be here recapitulated.

Barthez and Sanné think the lesions of the scarlatinal eruption begin with the superficial lymphatics and then extend to the capillary blood-vessels. There is no doubt but that the lymphatics are well-filled, but other authorities do not think the process begins within them.

Pearce (Boston City Hosp. Rep., S. x, 1899, p. 50) studied 23 fatal cases of scarlet fever, and has recorded the histological lesions found in the skin in 9 of them. He found, in addition to early dilatation and congestion of the blood-vessels, there was a slight dilatation of the lymphatics, together with the occasional presence of a few leucocytes and lymphoid cells about the lymphatic vessels beneath the rete Malpighii. He also observed a marked infiltration of the epithelium with polymorphonuclear leucocytes from the fifth to the tenth day. These

leucocytes were even found mixed with the desquamating epithelial cells, and in many instances with red blood-corpuscles as well. The deeper cells showed occasional mitosis. These results of Pearce tend to the opinion that the process may be inflammatory as well as of vasomotor origin; and they differ from the description of Unna in the marked infiltration and exudation of white blood-corpuscles.

Wyssokowitch thinks that the greatest intensity of the process is manifested about the sweat glands, the membrana propria of which seems thickened. The surrounding tissues are very much infiltrated with lymphoid corpuscles, and the ducts of the glands are filled with cellular detritus, the result of destruction of the epithelial lining of them. After the stage of hyperaemia and oedema, the cellular elements still remain to a limited extent, but in addition, we frequently see large numbers of red blood-corpuscles which have left the capillaries as a result of diapedesis or of rhexis.

Process of desquamation.

When the rash has disappeared, or sometimes when it is fading, the superficial layers of the epidermis are shed, desquamation being first noticed on those parts where the rash made its first appearance. It is most profuse in those cases where the rash has been most intense, and should be looked upon as due to the direct results of the disturbance of nutrition of the older cells of the skin. This disturbance of nutrition is induced by the local inflammatory action, and also by the action of the scarlatinal poison. Sanné thinks it is due to a mechanical infiltrating of the epidermis. Sometimes, as the result of these changes, we observe shedding of other epithelial structures - e.g., the hair, the nails of the fingers and toes, and even warts(Moore, p. 173).

MUCOUS MEMBRANES OF THE PHARYNX AND NOSE.

Here we find changes very much resembling those in the skin. The mucous membrane is found to be hyperaemic, often deeply so, with accumulation of leucocytes in the deeper layers. There is proliferation, followed by degeneration of the epithelial cells, leading, at first, to an increased secretion of the follicles, and afterwards to the exudation of fibrinous lymph. In severe cases we find sloughing and ulceration.

THE TONSILS.

The changes in these organs vary. In mild cases they are slightly swollen, with proliferation of the epithelial cells, and an increase in the secretion from the follicles. In septic cases we often notice extensive and deep ulceration, with small foci of suppuration in the substance of the tonsil. They may even slough "en masse," and the destructive process may involve the velum palati, the epiglottis, and the pillars of the fauces. In such cases the ulcerated surface is crowded with the micro-organisms of putrefaction.

THE TONGUE.

The changes seen in the tongue are very similar to those seen in the skin. Pearce examined 8 cases, and found that the process began much earlier and was much more pronounced. The papillae ~~was~~ were markedly involved. We should expect this from the clinical manifestations.

LYMPHATIC SYSTEM.

Enlargement of the lymphatic glands is a very common occurrence in scarlet fever. Those most usually affected are, the submaxillary, the maxillary, and the cervical (both anterior and posterior), but it is not uncommon to observe hyperplasia of all the lymphoid structures of the body.

To the naked eye, the usual change is one of simple enlargement (i.e., hyperplasia), although we frequently see the process has gone on to the formation of pus. The abscess may remain within the capsule of the gland, or it may become diffuse, leading to the formation of a connective tissue abscess, attended by much induration, and causing urgent symptoms, either from pressure, or by burrowing, or by eroding a blood-vessel and causing fatal haemorrhage. Abscesses are most common in the maxillary and submaxillary groups of glands.

Microscopically, Klein (Trans. Path. Soc., 1877) found the mononuclear cells to be very much diminished in number, and to be replaced by giant cells or intermediary forms. He observed plugs of fibrin in the veins in the cervical glands.

Crooke observed an inflammatory hyperplasia of the lymph follicles of the intestine, both simple and agminated. He also noticed large collections of round cells in the mucosa, so large in fact, as to almost amount to the formation of pseudo-follicles.

Pearce, as the result of his observations, came to the conclusion that the changes are not constant in all cases. In the lymph nodes he noticed congestion of the blood-vessels, and dilatation of the lymph-sinuses. The latter contained large endothelial cells, and these are frequently phagocytic, - containing red blood-corpuscles, lymphoid cells, and, less commonly, polymorphonuclear leucocytes. He found the lymph-nodules to be enlarged, with pale centres, due to the presence of large numbers of endothelial cells.

THE SPLEEN.

The lesions found in this organ cannot be regarded as uniform. Sometimes it appears to be normal in size, whilst at others it is enormously enlarged.

Histologically, we notice hyperplasia of the splenic pulp, with infiltration of plasma-cells, and enlargement of the Malpighian bodies. In the blood-vessels we find

thickening of the outer coat, proliferation of the muscular cells of the media, and hyaline swelling of the intima. The latter may be so pronounced as to occlude the lumen. There is also hyaline degeneration in the neighbourhood of the blood-vessels. Similar changes to those occurring in the lymph-follicles are frequently found in the central portions of the Malpighian bodies.

Local inflammatory or haemorrhagic lesions may be present in the organ.

THE HEART.

The changes found post-mortem in the heart after an attack of scarlet fever may arise from the scarlatinal poison alone, or may be due to the occurrence of a mixed infection with streptococci or staphylococci (pyogenic organisms) in the circulating blood.

In the heart muscle we notice two sets of changes:

1. Histological changes in the myocardium.
2. Changes in the increase or tension of the muscular fibres.

In the first set we find granular degeneration of the muscular tissue of the heart, the so-called acute parenchymatous myocarditis. This condition also occurs in persons who have died from other acute infectious diseases. It usually occurs very early in the disease, and may account for those cases of sudden collapse and death.

Romberg, in addition to the above, has also found evidence of interstitial myocarditis, where the myocardial fibres were separated by masses of cells, and the arterial blood-vessels showed distinct evidence of inflammation, - usually a periarteritis (he never saw an endarteritis). According to his observations, these changes occurred especially in scarlet fever, and not at all in diphtheria. Hesse does not agree with the latter statement, and he also noticed in addition to the above changes in the blood-vessels, hyperaemia, changes in their walls, collections of white blood-corpuscles in their lumen, and

also peri-vascular cell-proliferation. He considers that these changes might lead to chronic myocarditis.

In the second set, the changes lead to an increase in the size of the heart, as the result of either dilatation or hypertrophy. The earliest evidence of the action of the scarlatinal poison on the heart is the occurrence of acute dilatation, which very often comes on with great rapidity, and is often associated with murmurs of a transitory nature. In connection with nephritis we often find both dilatation and hypertrophy.

Goodhart was the first to call attention to the relation existing between acute nephritis and acute dilatation of the heart, although in Germany that honour is given to Friedländer. The latter ("Ueber Herzhypertrophie", Du Bois-Reymond, Arch. f. Physiol., 1881, S. 168) states as the result of his observations:

1. In children there hardly ever fails to be present a hypertrophy and dilatation of the heart; in adults this appears to be a less frequent occurrence.

2. The changes may affect both sides of the heart alike, but, as a rule, they are, however, developed more on the left side than on the right.

3. The heart increases in weight in children, on an average about 40 per cent.; but in some cases the minimum often exceeds this limit.

4. The increase in the size of the heart was in nearly all cases very marked; and the ventricles as well as the auricles were much dilated and filled with blood.

Henoch had drawn attention to the condition of the heart in scarlet fever before Goodhart; and Jäger states that two-thirds of all cases of scarlatinal nephritis are associated with hypertrophy of the heart, and frequently complicated with dilatation in addition. He examined 13 cases, and in 1 only did he notice dilatation without hypertrophy.

Goodhart records 5 fatal cases of sudden death in scarlatinal dropsy, and in all he found an overfilled left heart. He thinks that the myocardium has become affected during the height of the fever, and when this is complicated by nephritis, it is impossible for the heart to overcome the increased resistance.

Silbermann (Jahr. f. Kinderh., Vol. 17, p. 178) agrees with the observations of Goodhart and Friedländer, and thinks that an acute hypertrophy of the left ventricle may follow on this acute dilatation. He explains the cardiac changes as follows:

1. There is no disease in which the elimination of water is so suddenly and enormously diminished as in scarlatinal nephritis.

2. The glomeruli are principally affected.

3. There is such extensive involvement of the kidney structure.

4. The oedema compresses the blood-vessels of the skin, and in this way increases the heart-pressure.

5. Increased resistance in the aortic system is more readily followed by cardiac hypertrophy in children than in adults. If, from such causes as anaemia for example, there be any functional disturbance in the myocardium, then, instead of hypertrophy with dilatation, there will be primary dilatation, which increases very rapidly.

In addition to the above, we must take into consideration the effects produced by the toxines upon the heart. We know that the scarlatinal virus has a decided effect upon it, and it is an easy matter to explain the dilatation, when, in addition to the effects of the poison, there is an increased resistance to be overcome. From clinical experience, we know that in many conditions causing overstrain of the heart, dilatation of that organ is easily produced, e.g., in whooping-cough, and in bicycle riding, and forced marches in soldiers, a temporary dilatation often occurs; and, in children, this will occur

much sooner, as the heart yields more readily in them than in adults, because the stability of the myocardium is greater in the latter than in the former.

The scarlatinal heart is peculiar in this respect, that the hypertrophy takes place in a much shorter time than in compensatory hypertrophy with valvular disease. There are cases on record in which the whole process only took from one to three weeks; and the condition is observed oftener in children than in adults, because in the latter we more frequently see dilatation without hypertrophy.

Steffen records 6 cases of children in which no compensatory hypertrophy followed dilatation. This observer (Ueber einige Wichtige Krankh. des Kindlichen Alters, Tübingen, 1895, p. 211) considers the appearance of acute dilatation, especially in scarlatinal nephritis, to be of the greatest importance. According to him, it may take place so rapidly that the apex-beat may be found in the anterior axillary line within twenty-four hours or in twice that period. As a natural result, dilatation of the left side of the heart follows, whilst the right side may also be involved in a slight degree.

Riegel (Ueber die Veränderungen des Herzens und des Gefäss systems bei acuter Nephritis, Zeit. f. Klin. Med., Bd. 7, 1884, S. 260) has also studied the development of cardiac hypertrophy from a clinical standpoint: his conclusions are as follows:

1. Signs of an increased tension in the arterial system are evident in most, if not in all, cases of scarlatinal nephritis, from the beginning of the disease, and almost synchronously with the appearance of albuminuria.

2. With this increased tension of the aortic system there is usually associated, in a marked degree, a slowing of the cardiac action, and sometimes a slight irregularity of the same. There is a close relationship between the arterial pressure and the pulse-rate, - the more marked the former, the more considerable the slowing of the latter.

3. With the subsidence of the nephritis, the pulse-rate increases in the ratio that the arterial pressure decreases.

4. The cardiac enlargement is secondary to the increased arterial pressure, and appears only after the pressure has been increased for some time. In some cases the enlargement can be detected a few days after the onset of the nephritis.

Schmaltz (Münch. med. Woch., 1904, p. 1417) also draws attention to the cardiac changes in scarlet fever. He has studied 191 clinical cases, and does not include any in which the cardiac complication is associated with either sepsis or nephritis; of that number, 35 per cent showed abnormal symptoms in the circulatory system. He also states that the frequency of this complication varies in different epidemics as do all other complications; e.g., in 70 consecutive cases, of which only 1 died, 38 showed cardiac disturbances.

In 13 cases of Schmaltz, and in 20 collected by Schmorl, only 3 showed an endocarditis; and the former believes that the essential change in these cases is in the myocardium. He also thinks that the leaking of the mitral valve is for a long time due to the myocarditis only, and that, later, in some way which has not yet been explained in a satisfactory manner, the valves become altered.

We are quite justified in concluding, especially from our knowledge in other conditions, that a certain degree of dilatation is always present, even if it lasts but a short time; and that it is followed by a compensatory hypertrophy, - but the fact may not be clinically demonstrable. In these cases, the myocardium itself may appear normal, or show fatty degeneration, or it may even be the seat of graver focal lesions, depending to a great extent upon the cause of the dilatation.

When nephritis occurs during scarlet fever, the heart has to undertake an increased amount of work, owing to a rise in the tension of the circulation; and, consequently, an increased resistance. If the scarlatinal poison has produced a marked effect upon the myocardium, and so weakened it to a great extent, it is unequal to its task, becomes exhausted, and consequently dilatation follows. This may occur so suddenly and to such a degree that death may occur in a very short time. But if, on the other hand, the muscular fibres are able to overcome the resistance, and if there be an adequate amount of nourishment to supply them, the result will be a compensatory hypertrophy, which would occur very quickly if the resistance to be overcome by the heart is only slight. In some very rare cases, the lesion of the myocardium is sufficient to produce a dilatation.

THE PERICARDIUM.

It is not uncommon to find traces of pericarditis in persons dying of scarlet fever, although there was no suspicion that the condition existed during life. It may be due to a primary involvement of the pericardium, - a susceptibility which it shares in common with other serous membranes, - or it may be due to an extension from the myocardium. Sometimes in the simple form there may be a little exudation, but when due to the mixed infection of staphylococci and streptococci, the exudation is more abundant, and contains coagula of fibrin. The exudation may become sero-purulent, but purulent and haemorrhagic exudations are rare.

When due to dropsy (i.e., during the course of nephritis) there may be an enormous amount of fluid in the pericardial sac, and the mechanical resistance of the fluid has been said to prevent the heart from dilating. Sometimes in ordinary inflammatory conditions the amount of fluid may be very large.

Pericarditis is very liable to be followed by adhesions.

THE ENDOCARDIUM.

Endocarditis occurs oftener in scarlet fever than in diphtheria and typhoid fever. Although it is possible for it to occur as the result of the scarlatinal poison, it is produced, in the majority of instances, by the various pus-producers (staphylococcus pyogenes aureus and albus, the streptococcus pyogenes, etc.) and their toxines circulating in the blood. As a rule, the ordinary form of endocarditis is found, although many cases of endocarditis ulcerosa have been observed.

According to French observers, endocarditis is a much more common complication of scarlet fever than is supposed. The inflammatory results may be found on the endocardial lining of the cavity of the heart, leaving the valves free; or it may involve the valvular segments, giving rise to a simple thickening upon their margins. In mild cases we may see small excrescences; in severer ones, the condition known as endocarditis verrucosa.

As in other diseases, the condition is more common on the left side of the heart. Sometimes the lesions disappear; at others, the usual complications of valvular lesions in general develop; or, again, masses of detached fibrin may be washed into the circulation, producing haemorrhagic pulmonary infarcts, or emboli of the carotid arteries.

Wyssokowitch and Orth have not been able to isolate any micro-organisms in endocarditis verrucosa and endocarditis fibrinosa chronica; and it is more than probable that all cases do not originate in the same manner. Also, we must not overlook the actions of the toxines upon the endocardium. It is not yet decided whether the micro-organisms are brought to the endocardium by the blood or by the lymphatic circulation.

In some cases we may find the endocardium, myocardium, and pericardium all more or less involved in the inflammatory process, - in fact a true pancarditis.

THE KIDNEYS.

There has been an enormous amount of discussion on the subject of the pathological lesions found in the kidneys following scarlet fever; and, whilst some assert that the changes are to be found exclusively and essentially in the parenchyma, others think they are confined to the interstitial tissue, and others, again, look upon the process as a mixed form of nephritis.

Klebs (Handb. Path. Anat., Berlin, 1876, Vol. 1, p. 632), Klein (Trans. Path. Soc., 1877, p. 430), and Greenfield all regarded the changes in the scarlatinal kidney to be essentially glomerular.

According to these authorities, the constant lesions are to be found in the glomeruli and their capsules. We notice a proliferation of the nuclei of the capillary tufts of the glomeruli, and also an abundant growth of nuclei within the capsule, leading to adhesion between it and the glomerulus, and later on to compression and atrophy of the latter. The connective tissue around the glomerulus becomes crowded with nuclei, which develop afterwards into fibrous tissue. We also notice a peculiar hyaline change in the afferent vessel of the glomerulus, and also in its capillaries. Sometimes the lesions are to be found in a few glomeruli, but sometimes they are much more extensive. As the result of the obliteration of the space which naturally exists between the tuft and the capsule that encloses it, there must be complete abolition of the functions of the glomerulus, and also of the whole length of the corresponding convoluted tubule. Furthermore, owing to the changes in the tufts, there is an obstruction to the blood supply to the convoluted tubules, as the result of which the nutrition of their epithelium must be affected. They regard the changes in the glomeruli to be the essential part, and look upon the lesions of the tubal epithelium as being not only secondary, but of relatively small importance.

Klein examined 23 consecutive cases of scarlet fever, dying at periods of from two days to seven weeks, and in all of them he demonstrated glomerulo-nephritis. He further showed that the renal changes in all were associated with certain definite changes in the liver, spleen and lymphatic glands.

In 1883, Friedländer ("Ueber Nephritis Scarlatinosa", Fortsch. der Med., Bd. 1, S. 81) published the result of 229 necropsies in fatal cases of scarlet fever. As a result of his investigations he classified the pathological changes in the kidneys as follows:

1. Initial Catarrhal Nephritis.- This form occurs during the first week of the disease - i.e., either with or just after the rash. It is of short duration, not more than a few weeks at the most.

Macroscopically.- The kidneys are moderately hyperaemic; and the glomeruli usually appear as small, red points. As a rule, there is no marked cloudiness of the cortical substance.

Microscopically.- There is a slight degree of cloudy swelling of the epithelium of the convoluted tubules, which here and there shows marked proliferation, being cast off entirely at a later stage. The vessels of the glomerulus are normal, and sometimes there is an albuminous exudation between the capsule and the glomerulus. The capsular epithelium is slightly thickened, as a rule. In the convoluted, and sometimes in the straight tubules, we find hyaline and granular casts, or loose epithelial and small round cells. The only change in the interstitial substance is an accumulation here and there of small round cells.

In the second week there is complete regression, and we only see small numbers of microscopic fat granules in the somewhat enlarged epithelial cells of the tubules. The tubules also occasionally contain casts.

Clinically.- We notice only a very slight oedema, or perhaps none at all; the urine, as a rule, contains albumin and casts.

2. The Large, White, Haemorrhagic Kidney.- This form is observed especially in those cases with severe angina; also in phlegmon of the neck, and in severe septic scarlatinal nephritis, with small foci of bacteria in the tissues of the kidney. It usually occurs during the second, third, or fourth week of the disease, though it may occur in the first. He also called it interstitial septic nephritis, and considered it to be very rare, as he only saw it in 12 of the cases.

Macroscopically. - The kidneys are large, markedly flabby, and pale. The cortex is of a diffuse gray colour. As a rule, the glomeruli are not visible, and in their stead we notice a large number of haemorrhages, some small and punctate, others much larger.

Microscopically.- The interstitial tissue is seen to be infiltrated with small, round cells. As a rule, the changes in the epithelial cells are only slight.

3. Acute Glomerulo-Nephritis.- This form begins in the third week of the disease and later.

Macroscopically.- The kidneys contain the usual amount of blood, or they may be hyperaemic. Their consistency is increased. The glomeruli are empty of blood, and appear as small grayish points over the surface of the cortex. They are slightly larger than normal. In rare cases in which there has been a long persistence of the disease, the cortical substance shows a partial clouding.

Microscopically.- The changes are confined to the glomeruli. They contain little or no blood. There is a marked increase in the number of nuclei. The glomeruli are converted into solid masses, and the capsular epithelium, which is slightly thickened, can hardly be separated from the contents of the glomerulus. The interstitial tissue seems to be normal.

According to Friedländer, the foregoing account is typical of the nephritis of scarlet fever. He says it is the most important form, is almost characteristic, and agrees with the description first published by Klebs.

According to the statements of Wagner (Deut. Arch. f. klin. Med., 1880, Vol. 25, pp. 529 et seq.), a pure glomerulo-nephritis never follows scarlet fever, at any rate, he had never seen one. He says that "most frequently the large white kidney of Bright is found after a duration of a day or of a few weeks; sometimes with numerous petechiae, sometimes without them. The microscope alone makes the process clear and shows in many cases a great variation in the glomerular changes, in the tubules, and also in the stroma".

Wagner also describes a rare form of nephritis under the term acute lymphomatous nephritis. In this form the glomeruli appear small, and there is a cellular infiltration of the cortex. The cells are not of uniform size, some are much smaller and others much larger than a red blood-corpuscle; and the infiltration is more marked around the glomeruli, the capsules of which are often compressed together in either a symmetrical or irregular manner. In the interstitial tissue we notice small collections of cells between the more or less uniformly compressed tubules, and their epithelium has also suffered from pressure. In those areas which do not show these processes, the glomeruli, the stroma, the tubules, and the capillaries are all larger and more distended. The cases in which this form of nephritis was studied by Wagner, were all complicated by some septic infection; they showed severe pharyngeal diphtheritis, with suppurative joint involvements.

Crooke (Zur path. Anat. des Scharlachs, Fort. der Med., Bd. 3, S. 651) lays special stress upon the inflammation in the glomeruli, but at the same time he also notes early changes in the tubules and in the interstitial substance.

Sörensen (Ueber Scharlachnephritis, Zeit. f. klin. Med., Bd. 18, S. 298) also draws particular attention to the glomerular nephritis.

According to Councilman and Pearce, an acute interstitial nephritis is the most important renal lesion of scarlet fever.

Councilman (Boston City Hosp. Rep., viii S.,1897, pp. 38 et seq.) as a result of his investigations, divides cases of acute diffuse nephritis as follows:

1. Acute Degenerative Nephritis. - This form occurs chiefly in infectious diseases.

2. Acute Glomerular Nephritis. - This occurs in infectious diseases, especially in acute endocarditis, measles and diptheria.

3. Acute Haemorrhagic Nephritis.

4. Acute Interstitial Non-suppurative Nephritis.- This occurs especially in diphtheria and scarlet fever.

Macroscopically. - The kidney in this form is large, pale, and mottled. It appears moist and opaque on section, and the markings are obscure.

Microscopically. - The essential lesion appears to consist of an acute proliferation of the cells of the intertubular tissue, this proliferation taking place chiefly from the vascular endothelium. These cells, which lie within and without the vessels, are present chiefly in the intermediate zone of the kidney between the pyramids and cortex. He also noticed more or less degeneration and necrosis of the tubules. A small number of leucocytes may be present. The glomeruli are not affected.

Councilman described three cases of pure interstitial nephritis following scarlet fever in which there were no changes in the glomeruli. He also describes an adult kidney from a scarlet fever patient, in which the glomeruli were increased in size, the capsules being dilated and filled with epithelioid cells, and the cells in the glomeruli increased in number. He did not notice any increase in the connective tissue, nor any proliferation of the interstitial cells.

Councilman's classification is made upon a purely anatomical basis. He also states that, in all serious lesions of the kidney, we find that in one case the glomeruli are principally involved, whilst in others there are lesions of the connective tissue, these lesions consisting of active cell-proliferation. Accompanying the lesions in the glomeruli we may see degenerative changes

in the epithelium of the tubules, and these changes may be wholly or partly secondary to the glomerular lesions. On the other hand, he states that hyperplasia of the connective tissue, although often accompanied by degenerative changes in the epithelium, cannot be considered secondary to such changes.

Pearce examined 23 cases and found acute degenerative changes in all. In no case did he observe any change in the glomeruli; and he considered the acute interstitial nephritis as the important lesion. In 5 cases he found it was present in a slight degree, whilst in 4, which were fatal on the eighth, ninth, fourteenth, and fifteenth days respectively, he noticed the changes to be well marked.

When we have weighed up the whole of the discussion, we are bound to conclude that the occurrence of a true glomerular nephritis remains a characteristic lesion of the disease. Usually it occurs late in the course of the disease, in most cases after the establishment of convalescence, and may be due to a peculiar susceptibility on the part of the glomeruli, or of an unusual degree of virulence of, or a prolonged action of, the scarlatinal poison.

Macroscopically. - The appearances of the kidney vary. In those cases in which there has been no evidence of nephritis during life, and also in many in which the symptoms have been well marked, the kidneys present the same changes as may be found in the renal organs of those patients who die from any form of acute fever. We should find the cortex to present a somewhat cloudy appearance on section, and an increased amount of congestion throughout its substance. The capsule strips off easily, and leaves a raw looking surface, from which the blood exudes freely.

In the majority of cases, however, we notice enlargement (often considerable) of the organ, which is also congested. This congestion is well marked in the zone corresponding with the bases of the pyramids. Minute extravasations are frequently seen in the substance of the cortex, and also in the zone of greatest congestion. The

capsule strips readily, and the stellate veins are seen to be very turgid. The surface is congested and mottled, and minute haemorrhages are often seen upon it. The cortex on section is seen to be pale, opaque, and of a yellowish tint when washed, and its denuded surface also presents the same appearances. The Malpighian capsules appear to be well marked upon the surface of the kidney, and are seen as minute reddish-brown spots when a section is made through the cortex. The branches of the dilated interlobular arteries appear as small oozing points dotted all over the cut surface.

In those cases which have been complicated with nephritis, and where death has occurred at a later stage than in the preceding, we find the kidney is increased in size, this increase being chiefly noticeable in the cortex. The organ, although less congested, is more opaque, and appears to be fatty. The Malpighian tufts may be seen both on section, and on the denuded surface; but, as a rule, blood is not exuding from them, and they appear as yellowish dots.

When the kidney disease is of longer standing - e.g., from six to twelve months, the organ presents the appearances of a subacute interstitial nephritis. It is smaller in size, the cortex being much smaller in proportion; the capsule is more adherent, and does not strip so easily; the substance of the kidney is much firmer, and the Malpighian tufts cannot be observed projecting on the denuded surface.

Microscopically. - The essential changes are to be found in the glomeruli. There is intense congestion of the Malpighian tufts, and the smaller vessels of the cortex. These show hyaline degeneration of their internal coat, with an increase of nuclei in their muscular layer. As a consequence, there is narrowing and obliteration of their channels in parts, and this is more apparent at the junction of the afferent vessels with the Malpighian tufts. Thrombi are occasionally found at this point also. There is also proliferation of the cells of the supporting connective tissue, and also of those of the epithelium

lining the capsules. Owing to this proliferation, many of the capsules are so crowded with newly formed epithelium, that their functions are totally abolished. Next we see changes in the interstitial connective tissue. At first these changes are slight, but are much more pronounced after the ninth day. They consist of an aggregation of round cells or leucocytes in the connective tissue around the vessels in the cortex, and around the Malpighian capsules, and also to a less extent in the intertubular spaces. This accumulation of leucocytes is more noticeable around the small afferent arterioles, at a point just before they penetrate the Malpighian capsules, and it causes a compression which hinders the circulation through the vessels. The capsules are also involved in the process, and, as a result, they become thickened to a great degree, many of them being entirely destroyed. The epithelium lining the convoluted tubules, the interior of the Malpighian capsules, and also the straight tubules, show cloudy swelling, and eventually the tubules become more or less choked by the accumulation of cells undergoing fatty and granular degeneration. Sometimes blood is effused into their lumen, and many of them become filled with casts, which are composed of either red blood-corpuscles, or epithelial cells presenting all stages of degeneration.

Later Stage:- If death occurs at a later stage, the changes will be more marked in the interstitial tissue, and less so amongst the vascular elements. The organ is enlarged, and this enlargement is due do an increase of connective tissue cells in the cortex. There is considerable thickening of the Malpighian capsules, and, at the same time, their blood supply is more or less cut off. As the process advances, many of the capsules become obliterated.

In cases dying at a still later stage, the appearances approach more and more to those seen in the granular contracted kidney. The interstitial tissue contracts to a greater or less extent, leading to atrophy of the cortex. In these cases the capsule is very adherent, and can only be stripped from the surface with

very great difficulty.

There is a difference of opinion amongst authorities as to whether all the changes which have been described are necessarily present in all cases of scarlet fever, even in a slight degree, but we may always be confident that, when we have a history of acute nephritis, the glomeruli will be involved.

Corlett (p. 223) sums up the changes occurring during the scarlatinal process as follows:

1. Early Acute Degenerative Nephritis.- In this form the changes are purely degenerative, and consist of cloudy swelling, hyaline and fatty degeneration of the epithelium, which undergoes desquamation, followed by

2. Acute Interstitial Nephritis.- Here there are no changes in the glomeruli, but we notice a proliferation of the intertubular cells.

3. True Parenchymatous Nephritis.- Acute Glomerular Nephritis.- He considers this to be rare, and is characterised by glomerular changes, without any evidence of proliferation of the intertubular cells.

4. Pure Glomerulo-Nephritis.- This form is seen after the establishment of convalescence.

5. Occasionally we find changes due to an interstitial as well as a parenchymatous nephritis.

THE LIVER.

The changes found post-mortem in the liver in scarlet fever were first described by Wagner, Biermer, and Klein, and are similar to those which are to be found in the organ in persons dying from other acute infectious diseases. According to Litten, it is rare to find a case which does not show cloudy swelling of the hepatic cells, and in many cases we should also observe round celled infiltration and thickening of the connective tissue. This would be followed, in severe cases, by parenchymatous degeneration, passing on to destruction of

the liver substance (i.e., tofocal necrosis), and even to acute yellow atrophy. In some cases the round celled infiltration is seen to be intralobular. Fatty degeneration is observed in a great number of instances. Hesselwarth found hepatitis in 20 out of 81 cases examined by him. Liebermeister (Beit. zur path. Anat. u. Klin. der Leber Krankh., Tubingen, Lauph, 1864, S. 330) records the autopsy of a woman, aged 26 years, who died in a few hours of scarlet fever. He describes the liver as being in an early stage of acute parenchymatous degeneration. Wagner was the first to describe the changes in the liver under the name of acute interstitial hepatitis. These consist of a microscopical collection of cells in the connective tissue, in addition to the macroscopical granules. These changes, and also those causing focal necrosis, have been studied by Crooke, but they are not typical of scarlet fever, as they may be seen in many infectious diseases running a severe course.

Pearce examined 22 cases, and in 4 of these found certain focal lesions in the liver. These changes consisted essentially of small areas of necrotic liver cells with phagocytic cells in their capillaries, and cellular inclusions by the endothelial cells lining the capillaries. In those areas where the necrosis is well marked, he noticed polymorphonuclear leucocytes in many of the hepatic cells. There is no marked reaction about these areas.

THE OESOPHAGUS.

In many cases the oesophagus has been noticed to be intensely red and somewhat excoriated. The mucous membrane is very swollen and covered with much mucus.

THE STOMACH AND INTESTINES.

Changes are often found in the gastro-intestinal tract, especially in those who have died from the more severe forms of the disease. According to Fenwick (Medico-Chir. Trans., 1862, xlvii, p. 209), the changes occurring in the mucous membrane of the stomach in scarlet fever resemble those occurring in the mucous

membranes elsewhere in the disease; but, in addition, its epithelium takes part in the general desquamation of the skin. He also noticed that there is an absolute loss of the epithelium, more marked especially in mild than in severe cases.

Crooke (Zur path. Anat. des Scharlachs, Fort. der Med., Bd. 3, S. 653, 1885) gives his report of the examination of the stomach in a case which lasted only 26 hours. He found the mucous membrane much swollen, covered with mucus, and at the pyloric end it showed hyperplasia. It was opaque and pale with the exception of a few hyperaemic spots.

Microscopically.- He noticed the lymphatic tissues of the mucous membrane to be very hyperaemic, so much so in places, that they reached the surface and pressed the glands upwards and to one side. Many were necrotic in the centre and very friable. The lymphatic infiltration spread from these foci to the interglandular tissue, and produced the appearance of an interstitial gastritis spreading by foci throughout the entire membrane. He noticed distension of the blood-vessels of the interglandular tissue, often with proliferating nuclei in their walls. There was an infiltration of round cells in the upper glandular layer of the excreting glands, with desquamation of the cylindrical epithelium. The blind extremities of the glands are dilated, and are filled with a number of cells, which are devoid of nuclei, and are undergoing coagulation-necrosis. There is thickening of the muscularis mucosae, with small round celled infiltration, many of the cells showing an increase in the number of nuclei. Crooke also states that catarrhal gastritis was found in most cases in which it was looked for, and in severe cases he found both interstitial and follicular gastritis.

Pearce also records his observations on a case fatal on the second day of the disease. He noticed that the surface of the stomach was covered with a thick layer of mucous and dead epithelial cells. There was a marked

infiltration of polymorphonuclear leucocytes, and masses of bacteria-cocci- were present. In the interglandular tissue, plasma cells were noticed in large numbers, and there was enlargement of the lymph-nodules in the lower part of the mucous membrane. He also noticed the same changes, though in a less degree, in 3 other cases which were fatal before the fifteenth day of the disease.

Both in the large and small intestine we see well marked changes; and Virchow showed that the lymphatic follicles of the intestine and omentum were nearly always swollen. The mucous membrane is very soft and swollen; and Crooke found inflammatory hyperplasia of the lymph-follicles, with collections of round cells in the mucosa. These collections were so well marked in some cases that they gave the appearance of pseudo-follicles. The villi were swollen, infiltrated, and denuded of epithelium. These changes are often more marked in the solitary glands of the ileum than in Peyer's patches, but frequently both are equally affected. Sometimes the appearances are very much like those found in the intestine in typhoid fever, as the changes are most distinctive in the lower part of the ileum.

Hesselwarth has examined the gastro-intestinal tract in 81 cases, and in 21 he found severe gastro-enteritis.

THE PERITONEUM AND SEROUS MEMBRANES.

These are only rarely involved in simple scarlet fever. Sometimes we notice haemorrhage into their cavities; and in scarlatinal nephritis, any of them may become distended with fluid. In pleurisy with effusion, the exudate is very apt to become purulent (see case with chart, page 148). In tapping for effusion into the peritoneum or pleura, the dangers of converting a serous effusion into a purulent one must not be overlooked.

BONE-MARROW.

Pearce has studied the bone-marrow in 11 cases, and in all he found it to be very rich in cells. He noticed it to be most so in those cases fatal at two and three

years of age. The cellular elements consisted of cells closely resembling the plasma-cells, lymphoid cells, and neutrophilic leucocytes. He also noticed that nucleated red blood-corpuscles, giant cells, and eosinophilic cells were present in large numbers.

THE BLOOD.

Of late years great attention has been paid to the study of the blood in scarlet fever, and much has been learned. According to the researches of Felsenthal and Bernhard, the specific gravity of the blood is reduced in all cases. The haemoglobin is reduced in all cases also, and the reduction varies with the character and severity of the infection. When complications (e.g., nephritis) occur, it is apt to be reduced quickly, especially if there are any exacerbations during the course of the illness.

Raskin has found streptococci pyogenes in the circulating blood in 2 out of 64 cases. Sittman examined the blood for micro-organisms in 2 cases, and Kraus in 4 but the results were negative.

The first systematic account of the changes in the blood in scarlet fever were published by Hayem, and further investigations have been made by, amongst others, Halla, Reinert, Zappert, Rieder, and Kotschetkoff.

According to Hayem there is a decrease of about one million red cells after defervescence, and in average cases, there was a moderate leucocytosis, which was much increased by suppurative changes occurring during the disease, or by severe angina. In addition, he states, the whole blood shows in a slight degree the usual effects noticed in fever. The formation of fibrin is usually increased, being much more marked in those cases complicated by suppurative processes, or showing extensive angina.

In a case of the septicaemic type of the disease, Heubner noted haemoglobinaemia.

Red Cells.- As a result of his investigations, Kotschetkoff found the red cells were reduced to three millions per cubic millimetre. He states that the regeneration of the blood was slow and took some time, and was complete only after six weeks, or even much longer.

In 6 cases examined by Zappert, less than four millions per cubic millimetre were found in 1 case only.

Many other investigators - e.g., Reinert, Leichtenstern, etc., only found slight anaemia in a great number of cases.

Leucocytes.- In scarlet fever the white blood- corpuscles are constantly increased; thus differing from measles in which there is no leucocytosis.

Kotschetkoff classified the cases of scarlet fever according to their leucocytosis as follows:

1. The mild cases.- These showed between ten and twenty thousand white cells per cubic millimetre.

2. The moderately severe cases.- These showed between twenty and thirty thousand white cells per cubic millimetre.

3. The very severe cases, showing from thirty to forty thousand white cells per cubic millimetre. These are usually fatal, and in some cases in which death occurred very rapidly over forty thousand leucocytes were found.

Rieder examined the blood in 10 cases, some of which were complicated with pneumonia and croupous pharyngitis, and were fatal, and yet he never found more than twenty-three thousand cells. In most instances the number was less than twenty thousand.

Felsenthal examined the blood in 6 cases of moderate severity occurring in children, and found eighteen to thirty thousand white cells.

The leucocytosis begins about one or two or even three days before the appearance of the rash, and reaches its maximum with or shortly after its full development

(i.e., about the third or fourth day of the eruption). As a rule, it continues for four or five days after the disappearance of the eruption, and then gradually falls, although in some cases it may show a rapid fall with the rash. It remains above the normal for days or even weeks after the temperature has become normal.

The grade of leucocytosis, as a rule, corresponds to the severity of the disease, and is well marked in those cases presenting severe angina. It is not affected by the height of the temperature, and, according to Kotschetkoff, it is not influenced by complications, such as lymphadenitis, otitis, and nephritis.

Rieder noticed a slight excess in some of his cases complicated by pneumonia.

Pee observed increased leucocytosis in 2 cases in which the lymph-nodes began to swell late in the disease.

Type of Leucocytosis.- The polynuclear cells are increased in all cases, the percentage varying from 85 per cent to 95 per cent., according to the severity of the disease. The maximum increase is reached on the second day of the rash, and then declines slowly. The proportion of polynuclear cells shows only a slight fall in fatal cases.

According to Kotschetkoff, the eosinophile cells show variations which are quite characteristic. With the exception of the very severe cases, they are normal or subnormal at first; after two or three days they slowly and steadily increase, and reach a maximum of 8 to 15 per cent during the second or third week. After this they decline slowly, and by the sixth week the normal figure is reached. The eosinophiles may disappear very early in fatal cases, and, according to Kotschetkoff, this sign is so constant that one is able to base a prognosis upon it. The lymphocytes are diminished at first, but later on attain their normal proportions.

The conclusions of Kotschetkoff have not been endorsed by all authorities - e.g., Bensaude, in one case, noticed as high as 20 per cent of eosins; Weiss found no eosins, in one case, when the eruption was at its height; and, again, a fatal case observed by Rille, showed well marked eosinophilia.

According to Klein, lymphocytosis may occur during convalescence; and many observers, e.g., Rieder and Turk, have noticed a high and persistent leucocytosis, especially occurring in cases presenting complications, such as nephritis, etc.

According to the latter authority, the leucocytes undergo a remarkable change about the fifth day of the disease. The eosins and the lymphocytes show a marked increase, and at the same time, the polynuclear cells rapidly diminish. He regards this secondary leucocytosis as being similar to that seen in smallpox.

Van der Berg (Arch. f. Kinder., 1898, Vol. 25, pp. 321 et seq.) has studied the blood in 12 cases of scarlet fever, in all of which he noticed leucocytosis. It began early, and reached its maximum on the fourth or sixth day. Unless the disease ran a very mild course, the leucocytosis persisted for about twenty to thirty days on the average, but was prolonged beyond that time when some complication intervened. He could not trace any relationship between the rash and the leucocytosis, and commencing desquamation had no effect upon it. He also stated that the adult forms were chiefly increased, and that there was a persistence of the eosinophiles.

Sevestre (St. Bart. Hosp. Rep., 1896, Vol. 32, p. 222) does not agree with Van der Berg. He observed a close relationship between the rash and the leucocytosis, the latter varying with the severity of the former, and also with the fading of the same. He also states that the leucocytosis shows a marked diminution in numbers.

Erber (Zeit. f. Heilk., 1904, p. 274) states that in scarlet fever the red blood-corpuscles gradually decrease

in number during the course of the disease; and, somewhat more rapidly, there occurs a fall in the haemoglobin content. There is a very considerable increase in the number of polymorphonuclear leucocytes, and, inasmuch as the lymphocytes remain practically normal in number, this increase is both absolute and relative. This is a contrast to measles, in which the increase is relative only. The eosinophile cells are practically unaltered.

THE PANCREAS.

The changes found post-mortem in the pancreas are not distinctive, but are common to all infective fevers.

THE RESPIRATORY SYSTEM.

We may often find traces of bronchitis and broncho-pneumonia, although during life they have not been suspected, owing to the severity of other symptoms. According to Leichtenstern, we sometimes observe what he has called "acute desquamative pneumonia". - It is essentially an acute lobar pneumonia, occurring usually in children, and involving the upper lobe, - it may only involve a lobule. In these cases the lung is very dense, and on section presents a smooth, homogeneous, bluish-red surface. It is full of blood, although containing little serum.

The lungs may also show septic foci, passing on to the formation of abscesses, or ending in gangrene. This is noticeable in those cases presenting septic complications during life. In cases complicated with nephritis we see an oedematous condition; and Leichtenstern has drawn attention to the occurrence of "acute oedematous infiltrations" (inflammatory oedemas) in that complication. In these cases there is complete absence of air, attended with much serous exudation.

It is rare to find true croupous pneumonia.

THE PLEURA.

The pleura may show inflammatory changes, either dry or with exudation, and, as a rule, the effusion is

unilateral. It may be sero-fibrinous or purulent. In the latter form O. Vierordt has found streptococci. In cases complicated with nephritis we often find an oedematous condition.

THE EYE.

We are apt to see a variety of lesions in this organ. The lachrymal gland and sac may be the seat of inflammation going on to suppuration. The conjunctiva may show simple or diphtheritic inflammation; keratitis and corneal abscess are not uncommon, whilst in septic cases we may find orbital cellulitis, panophthalmitis, and even septic processes in the retina. Optic neuritis may occur, and in cases complicated with nephritis, we often see neuro-retinitis.

THE EAR.

The middle ear frequently shows signs of inflammation due to extension along the Eustachian tubes from the pharynx, and is usually bilateral. The tympanic membrane is commonly seen to be perforated. As a rule, the mild or catarrhal form is the one chiefly observed, but many cases are purulent.

THE NERVOUS SYSTEM.

In this system the changes are often well marked. Meningitis is frequently seen, and in many cases may be purulent. It is due to extension from the middle ear. Abscess in the tempero-sphenoidal lobe is also found, and also septic thrombosis of the lateral sinus. Both of these are usually the result of extension from the middle ear also. We may notice foci of pus in the brain substance leading to softening and necrosis. These foci are either due to organisms floating about in the circulating blood, or to infected emboli from the heart, or from the pulmonary veins.

THE ARTICULAR SYSTEM.

In mild cases we may see a serous synovitis during the desquamation (scarlatinal rheumatism or synovitis). In the septic type of the disease, the joints are the seat of purulent effusion (suppurative or

purulent arthritis), the result of septic emboli. The streptococcus pyogenes, in pure culture, has been found in both the serous synovitis, and in purulent arthritis. Occasionally other micrococci are found. In some cases we find a periarticular abscess, which often bursts into the joint.

Tuberculous disease of the joints (white swelling) has been observed to follow the above changes.

THE MUSCULAR SYSTEM.

Myositis has sometimes been known to occur, the muscles chiefly affected being the lumbar, intercostal, pectoral, and abdominal. Pyaemic abscesses frequently are seen in the muscles. They are the result of emboli from some septic source.

THE GENERATIVE ORGANS.

In girls, especially in those who are ill-fed and neglected, gangrene or noma of the vulva is sometimes found. A spot on the vulva becomes inflamed, swollen, and oedematous, and of a dusky-red colour. This leads on to necrosis, sloughing and ulceration. The ulceration may extend over the thighs and abdomen.

SYMPTOMATOLOGY.

In order to enable one to thoroughly discuss the symptomatology of scarlet fever, it is necessary to divide the course of the disease into various stages, as follows:

I. The Incubatory Stage. - This extends from the introduction of the poison into the system until the first symptom of illness.

II. The Stage of Invasion.- This extends from the first symptom until the appearance of the exanthem.

III. The Eruptive Stage.- Presence of the rash.

IV. The Desquamative Stage.- Peeling of the skin.

(Berg (Med. Rec., 1904, ii, p. 1) discusses the course of the fever in scarlatina, and objects to the customary division of the disease into three stages of invasion, eruption, and desquamation. Instead, he suggests a division into stages of eruption, defervescence, and desquamation. The period usually described under the stage of invasion he would include in the eruptive stage under the name of the enanthematic period. In this he includes those changes in the mucous membrane which precede the appearance of the cutaneous eruption, such as the pharyngitis, the tonsillitis, and the changes in the tongue. Between the stages of defervescence and desquamation there is, according to him, a period of several days during which the skin looks quite normal.)

I. THE INCUBATORY STAGE.

Before we can accept the statistics of any observer as being accurate in determining the length of the stage of incubation in scarlet fever we must be prepared to state that the patient has had no opportunity of contact with the infection, besides the one mentioned in the report. As this is an exceedingly difficult matter to do, it follows that different observers have given widely

different opinions on the subject.

Compared with enterica, typhus, measles, or smallpox, the incubation stage of scarlet fever is very short; and Trousseau was the first to insist upon its shortness. In that he was corroborated by Murchison, who said that this period might vary from several minutes to five or six days.

It is very difficult in many cases to arrive at the exact time of infection, and, according to Barthez and Sanné, the worst time to study the length of the incubatory stage is during the prevalence of an epidemic, as at that time the source of the infection cannot always be determined, at any rate, with any degree of accuracy.

The poison must get into the blood, where, according to Jamieson, it multiplies rapidly. When it is introduced into a wound, we should expect a short period of incubation, as it is practically introduced direct into the circulation, and in this, we are confirmed by clinical experience. In surgical and puerperal scarlatina we find the period of incubation to be very short; and, according to Lörensen, who studied 38 cases, it does not exceed forty-eight hours. On another page the writer has mentioned that Hagenbach states that in scarlet fever following tracheotomy wounds in children, he found the incubation stage to be very short; and again he states that Paget thought that many cases of sudden death occurring on the second or third day after operation may be due to malignant scarlet fever; with this opinion Goodhart and Howse's views coincide. In these cases the incubatory period would only be twenty-four hours.

Trélat and Bokai each record two cases in which the disease developed within twenty-four hours after operation.

On pages 21, 29 the writer mentions the case of Von Leube who wounded himself whilst making a post-mortem examination on a body of a patient dead from scarlet fever. In his case the incubation period was eleven days.

When the poison is introduced through the throat - i.e., in a tonsillar crypt, it has, comparatively speaking,

a long way to go before it reaches the blood by means of the lymphatics, and hence we should expect the period of incubation to be longer.

Again, the stronger the poison, and the greater the quantity introduced, the more rapid, and the more intense will be its effects.

In a mild epidemic the stage of incubation would be longer, in the majority of cases, than in a severe epidemic, and this has been confirmed by Johannessen. According to him, in a mild epidemic which occurred in Norway, the incubation lasted ten days; in another of medium severity, six days; in another which was characterised by severe initial symptoms, the duration was only thirty-four hours.

We should also expect the individual predisposition to have some influence upon the incubatory stage, as some people are much more liable to contract the disease; and perhaps in them the duration of that stage would be shorter.

In the great majority of cases the period of incubation lasts from a few days to a week. Eichhorst (Spec. Path. u. Therap., Leipzig, 1897, Vol. 4, p. 231) and Von Leube (Spec. Diag. der Inn. Krankh., Leipzig, 1898, p. 413) consider it to be from four to seven days, although many observers consider the usual length to be three days. Next in frequency come those showing a period of two or four days; then those showing a period of five days; and, least of all and the rarest, a period of six days.

Jamieson states that a longer period than three days (up to six days) can only be possible when the contagion has lodged itself in the body, but not as yet entered the blood.

Pye-Smith (Fagge's Med., 3d Edn., Vol. 1, p. 186) mentions a case which came under his own observation:

"A child left his father's house, where three of the family had died from scarlatina, on November the 19th, and continued well until December the 2nd, when he developed the disease, just a fortnight after the last

exposure to the contagion. It is, however, possible either that the infection was from a different and more recent source, or that it was derived from fomites which, notwithstanding every care, may have been carried away with him from the house".

In the case observed by myself, and mentioned before on page 34, the child was discharged from the Sheffield Fever Hospital on June the 12th, and the two sisters were taken ill on June the 15th - i.e., three days after exposure to the infection.

According to Tonge-Smith ("The Incubation of Scarlet Fever", Brit. Med. Jour., Jan., 1883, pp. 150,151), the incubation is never longer than three days.

Murchison, as a result of his observations, states that the incubation period never went beyond six days. In the London Lancet (1864, Vol. 2, pp. 481-485), amongst his "Contributions to the Etiology, Pathology, and Treatment of Scarlet Fever", he mentions thirteen cases from which he could draw certain conclusions as to the true incubation period. These were as follows:

Less than	24 hours'	duration. -	2 cases.
" "	31½ "	"	1 case.
" "	36 "	"	1 "
" "	40 "	"	1 "
" "	3 days	"	2 cases.
" "	3½ "	"	1 case.
" "	4 "	"	1 "
" "	5 "	"	3 cases.
" "	6 "	"	1 case.

In 1878, the same authority ("Observations on the Incubation Period of Scarlet Fever", Trans. Clin. Soc., London, 1878, Vol. 11, pp. 238-265) published a series of seventy-five cases, and in none was the duration of incubation more than six days.

In some the duration may be only a few hours, - twenty-four, or even less. Richardson states that he broke out with scarlet fever when auscultating a patient.

Trousseau, in his Clinical Lectures, mentions the case of " a merchant who had taken his daughter from London to Eaux-Bonnes in the Pyrenees, and then passed the winter with her at Pau. On his return journey to England he stopped at Paris, intending to pass several days there. His eldest daughter had remained in London, where she had charge of the household. Full of impatience to embrace her father and sister, she started towards Paris, was taken with fever and sore-throat on the way across the Channel, and arrived six or seven hours later with a severe attack of scarlet fever. She arrived at the hotel almost at the same moment that her father and sister came from Pau. Her sister occupied the same room with her, and exhibited twenty-four hours later the first symptoms of a fortunately light case of scarlatina.

At that time, moreover, scarlatina was epidemic in London but not in Pau".

On the other hand, many observers state that the average duration of the incubation period is much longer than six days. According to Hoff ("Sundhedskollegiets Aarsber"., 1876; Cited by v. Jürgensen, "Acute Exantheme Scharlach, Rotheln, Varicellen", Wein, 1896, p. 7), who made his observations during the epidemic of scarlet fever occurring in the Faroe Islands during the years 1873-1875, the stage of incubation was eight or nine days. He mentions the case of a sailor, who left a port where the disease was raging, and who was at sea for nine days before he first noticed the eruption; and also a peasant girl who began with the disease on November the 19th, and whose two sisters first showed signs of the illness on November the 27th and the 28th. He also states that the length of the stage of incubation may vary, and this variation can always be explained, just as we can also account for those cases where occupants of a house where scarlet fever has obtained a footing are attacked at intervals of one or several days. This may be due to the varying susceptibility of the individual, in addition to which we must take into account the persistency and tenacity of the infection.

Petersen (Cited by v. Jürgensen) and Lund also studied cases occurring in the same epidemic. The former stated the duration to be nine to eleven days in those cases which furnished accurate data; the latter refers to nine cases, of which

1 showed a duration of 9 days.
5 " " " " 10 "
3 " " " " 11 "

E. Hagenbach-Burkhardt has published two articles. In the first ("Zur Aetiol. des Scharlachs", Jahr. f. Kinderh., N.F., Bd. 8, S. 288) he mentions four cases with an incubation period of about three, seven, eleven, and fourteen days. In the second ("Ueber Spitalinfection", Jahr. f. Kinderh., N.F., Bd. 24, S. 105) he reports fifty-eight cases, but at the same time remarks that he considers them only to be approximately exact. His figures are:

An incubation period of under 1 day in 1 case.
" " " " " 2 days " 1 "
" " " " " 3 " " 4 cases.
" " " " " 4 " " 5 "
" " " " " 5 " " 1 case.
" " " " " 6 " " 7 cases.
" " " " " 7 " " 3 "
" " " " " 8 " " 4 "
" " " " " 9 " " 2 "
" " " " " 10 " " 1 case.
" " " " " 11 " " 5 cases.
" " " " " 12 " " 1 case.
" " " " " 13 " " 4 cases.
" " " " " 14 " " 2 "
" " " " " 15 " " 5 "
" " " " " 17 " " 2 "

An incubation period of under 18 days in 1 case.
" " " " " 19 " " 2 cases.
" " " " over 20 " " 6 "

According to these figures, in 38 cases it exceeded six days (or 65.5 per cent.); and of an incubation period longer than twelve days we have 22 cases - i.e., 38 per cent. He thinks his results are as nearly accurate, as such observations can be, and admits that perhaps some of them may have been infected in an indirect manner, especially those in which the period of incubation was long.

Johannessen (p. 166) mentions that it appears probable, in some cases, for the incubation to last as long as six weeks!

The accurate determination of the incubatory stage of scarlet fever is of the greatest importance to the managers of schools, parents, etc. Medical men are often asked how soon it is safe to send children to school, after they have been exposed to the infection. From our present knowledge we should say that, provided the first case has been properly isolated, and there has been adequate disinfection, all danger is passed if there has been no fresh case occurring within seven days.

The stage of incubation is devoid of symptoms, the first manifestation of the disease appearing during the stage of invasion.

As the different symptoms present themselves in varying degrees of intensity, in the different forms of the disease, it is more convenient to discuss each form in detail.

A. SIMPLE SCARLET FEVER - SCARLATINA SIMPLEX, SCARLATINA BENIGNA.

II. THE STAGE OF INVASION.

The symptoms of this period develop with characteristic suddenness; we recognise some sudden change in the condition of the patient; and, according to some authorities, a forecast of the subsequent severity of the disease can be made from the intensity of these symptoms during this period. They consider that a severe invasion

is followed by a severe attack of the disease; but this statement is disputed by Henoch, who holds that the intensity of the initial symptoms bears no intimate relation to the severity of the infection.

The duration of this stage is usually very short; most observers give it at about twenty-four hours, - and this was the opinion of older authorities, e.g., Sprengel and Wendt, although some thought it might be less. Barthez and Sanné gave it at 12 to 24 hours, or even less; v. Leube and Unterberger, 1 to 2 days; Hebra and Kaposi from 12 to 24 hours to 2 to 3 days; Billington 18 hours; Archambault 22 to 36 hours; J. B. Ayer gave the average as being 24 hours, the longest, 48 hours; Eichhorst (p. 232) 24 to 48 hours. Henoch ("Vorles. ueber Kinderkr.", Berlin, 1897, p. 643) stated it was usually 24 hours, though it may be 36 to 48 hours; Albertza from 2 to 3 hours to the same number of days; Moizard, whilst stating the usual duration of this stage to be from 12 to 36 hours, mentions a case in which the eruption did not appear until the sixth day. Mayr ("Scarlatina", in Hebra's "Diseases of the Skin", Trans. Sydenh. Soc., Lond., 1886, Vol. 1, p. 190) says the stage of invasion may last several days; and, according to Trousseau, in exceptional cases, it may be as long as nine days. Bohn considers it to last from twelve to twenty-four hours as a rule, though sometimes it may be prolonged to twenty-eight days.

In very mild cases children may only complain of a slight tickling in the throat, and of aching in the limbs; but, as a rule, in the great majority of cases, the disease commences abruptly with headache, fever, sore-throat, and voniting. In children, we often find it ushered in with convulsions; and, according to Thomas ("Scarlatina", in Von Ziemssen's "Cyclop. of the Prac. of Med., N. Y., 1875, Vol. 2, p. 238) vomiting occurring with convulsions at the beginning of an illness, is seen oftener in scarlet fever than in any other disease of childhood, with the exception of pneumonia and smallpox; vomiting, whilst occurring in the majority of cases, is much more common in children than in adults, and, according to Archambault,

it occurs in all children when there is anything in the stomach. Billington states that, out of 102 cases, he noticed it in 80, whilst, on the other hand, J.B. Ayer says he only saw it in 3 out of 20. The vomited matter consists of the contents of the stomach, mucus, and, in many cases, biliary matter. Persistent vomiting is a frequent symptom of the malignant form of the disease, and is of ill omen.

Constipation is the rule, though very often diarrhoea occurs, - especially in children, or when the attack is likely to be very severe.

In adults the invasion usually begins with soreness of the throat, a sense of chilliness, or even a rigor, headache, and vomiting, - the headache being a more prominent symptom in them than in children. The patient feels ill, is prostrate and languid, has no inclination for work, and complains of anorexia, thirst, and aching of the limbs. Sometimes he is drowsy, at others, he complains of sleeplessness, or of broken rest; and he may even be delirious, or more or less comatose. With the sore-throat there may be painful deglutition, and submaxillary tenderness.

Henoch has observed epileptiform convulsions at the onset of the disease; and, according to other observers, there may be a sudden attack of syncope.

The aspect of a patient with the disease at the end of the first day is that of an early stage of an acute febrile disease. Children, as a rule, resent being disturbed, and are dull and apathetic, though sometimes when the temperature is high, they may be delirious and very restless. In the very severe forms these symptoms will, of course, be more pronounced. Adults complain of being weary and tired; their expression is usually dull and listless, and there is a disinclination to work. The face is flushed, and fuller than normal, the eyes are heavy and dull; and, although there may be slight injection of the conjunctiva, there is no lachrymation as in measles. The region around the mouth is pale and white,

and shows a marked contrast with the vividly red cheeks. The functions of the sensorium are not impaired. Caiger says the aspect of the patient is usually intelligent, and the eyes bright and sparkling.

The skin feels very hot, the extreme dryness giving one the impression that it is hotter than is really the case. The pungent heat of the skin can only be compared with that of acute pneumonia, a fact which has been observed since the days of Addison.

Respiration is accelerated, but the lungs are clear, unless there is some co-existent disease.

The lymphatic glands are enlarged and tender to the touch, especially the submaxillary, and the anterior and posterior cervical groups, - though frequently the epitrochlear, the inguinal, and the axillary are also affected. The liver and spleen are usually enlarged, but not sufficiently so as to be demonstrable by palpation.

The tongue is coated with a creamy fur of varying thickness, as in other febrile diseases. This fur is uniformly distributed over the surface, leaving the edges reddenned. Soon the fungiform papillae become hyperaemic and enlarged, and project as bright, shining, scarlet points, giving to the tongue the so-called appearance of a white strawberry. In many cases the papillae do not become enlarged, and the writer frequently remarked that a great proportion of the cases admitted into the Swallownest Hospital did not present that tongue that is supposed to be so characteristic of the disease. German writers draw attention to a peculiar miliary eruption as sometimes occurring on the dorsum of the tongue.

The temperature suddenly rises and reaches a maximum of 104°F. or 105°F at the end of the stage of invasion; and the pulse, which is of high tension, is remarkably rapid. The younger the child, as a rule, the more rapid the pulse-rate, and it is a common occurrence for it to show 140 or even 160 beats per minute. This rate is not of unfavourable augury, and need not cause any anxiety, even in older children; and a rate of 120 in

adults is by no means uncommon at this stage of the disease. One of the distinguishing features of scarlet fever is the disproportion between the height of the temperature and the pulse-rate, and this disproportion may continue for a long time, or even persist throughout the course of the illness. Trousseau, in his Clinical Lectures, laid great stress upon this point.

In very mild cases the throat symptoms may be absent, but, as a rule, we find the tonsils to be reddened, more or less swollen, and not infrequently partially covered with a whitish translucent mucus. They may be so enlarged as to touch the uvula, and so block up the passage; and the uvula may also be covered with a whitish film, which has extended from the tonsils, and which must not be mistaken for a diphtheritic membrane. The mucous glands of the tonsil may swell, so that the affected part will present a granular appearance, and the secretion may accumulate upon the surface, so as to simulate the presence of ulcers.

The mouth is dry, its mucous membrane reddened, and the arches of the palate and uvula more or less reddened also, or even of a purplish tint. Sometimes, but not in all cases, they are swollen, and the redness may extend to the roof of the mouth and pharynx.

Monti ("Studien ueber das Verhaten der Schleinhaute bei den acuten Exanthem.", Jahr. f. Kinderh., N.F., Vol.7, pp. 227 et seq.) has called attention to the state of the throat in the stage of invasion of scarlet fever. According to him, the enanthem appears late on the first, or early on the second, day of the disease, as a diffuse mottled reddening, beginning usually upon the uvula, then spreading quickly over the hard and soft palates. It covers the pillars of the fauces, and finally spreads to the mucous membrane of the cheeks and gums. As a rule, it does not extend on to the post-pharyngeal wall. Monti thinks the latter is an important diagnostic point between scarlet fever and smallpox.

Alonzo Clark maintains that there is no scarlet fever without inflammation of the pharynx. He considers

it to be an integral part of the disease, and that an eruption without it cannot be true scarlatina.

Sometimes a patient will suffer from a sore-throat for a few days; this will become aggravated, with a rise of temperature, vomiting, and headache, and other signs of the invasion proper. In these cases the primary sore-throat is not connected with the attack at all, but is a simple tonsillitis, which predisposing to it, renders the patient more susceptible to the scarlatinal poison.

The urine, as in other febrile attacks, is scanty, high-coloured, unduly acid in reaction, and deposits a copious amount of lithates on cooling. Even at this stage, it may contain a slight amount of albumen, especially if the temperature be high. Urea shows a considerable increase, but the chlorides are diminished. The potash salts are proportionately increased.

III. THE ERUPTIVE STAGE.

As a rule, the characteristic exanthem appears in from twelve to thirty hours (usually within the first twenty-four) after the commencement of the illness, and is seen first on the sides of the neck, and the upper part of the chest beneath the clavicles. It extends rapidly in a few hours from these regions to the arms, the abdomen, the back, and lastly to the lower extremities. On the latter it may not make its appearance for twenty-four hours after it is first seen on the neck. As a rule, it is not seen on the face, but when it appears there, it is usually limited to the forehead and cheeks; the circumoral region remaining free from eruption, presents a peculiar pallor, which stands out in bold contrast with the flushed and injected cheeks.

Dukes (Ency. Med., Vol. 10, p. 495) states that the rash does present itself on the face, where it is less raised in character. It also appears behind the ears, and, he also thinks, on the hairy scalp. According to him, it begins on the scalp, extends to the face, neck, chest, and then downwards over the whole body; and, in

further proof of this, he says that the earliest desquamation is perceptible on the tips of the ears, and on the prolabium of the lips.

Von Jürgensen says it is occasionally seen on the cheeks, always on the forehead, and scalp, and, as a rule, on the ears.

The rash begins as discrete, closely packed, red points, about the size of a pin-point, occupying the site of the hair follicles. They are slightly elevated, but not sufficiently so as to be sensible to the touch. At first these points are separated from each other by pale areas of skin, but soon, this paleness is replaced by an erythematous tinge; whilst at the same time a slight oedema of the skin occurs, so that, at the end of twenty-four hours, it presents its characteristic uniform scarlet colour, to which the terms "boiled lobster" or "raspberry juice" have been applied. It is to be noted that the erythema appears after, and disappears before, the puncta.

The colour and duration of the rash vary in different cases, and are modified by the character of the epidemic, and the nature of the skin upon which it develops. The intensity of the colour is increased by a hot bath, the warmth of the bed-clothes, and also by crying. In anaemic persons the rash is usually of a light-pink colour, whereas it develops more rapidly in full-blooded persons, and in blondes than in brunettes.

The eruption spreads very rapidly, so that by the end of the fourth day of the illness, the whole body is covered with it, and on those parts liable to pressure or irritation, e.g., nates and back, it is much more pronounced. It is said to present one great characteristic - viz., a peculiar reaction upon pressure, so that, when pressure is applied, it becomes paler, and when the pressure is removed the redness returns - first at the centre, and then extends to the circumference. This is not pathognomonic, but is also found in other skin diseases characterised by much hyperaemia about the

openings of the cutaneous glands. When the eruption is haemorrhagic, this paling, of course, is not seen.

The eruption is well marked on the inner aspect of the thighs, and on the abdomen; whilst, on the outer sides of the thighs, legs, and upper arms, positions where the surface of the skin is coarsely papular, it shows numerous large and indurated papules, a condition noticed by Watson. The extensor surfaces of the joints show a well marked rash, and it is also well developed on the dorsum of the feet, and on the back of the hands; but, on the soles of the feet and the palms of the hands, the punctate appearance is not seen, though these parts may be deeply injected. Usually there is more or less swelling of the hands and fingers, and, according to Trousseau, the tumefaction may be so intense that the patient is prevented from closing the hand.

On the extremities, there is a tendency for the rash to occupy the extensor rather than the flexor surfaces, and both here and on the trunk it is apt to appear in irregular patches of varying size. When the eruption is fully developed, the skin feels dry and tense.

As a rule, the rash is fully developed by the end of the second or third day, remains at its height for about three or four days (varying from one to as much as six or seven), and then fades in the order of its appearance; and, in a well-developed case, it has usually disappeared by the end of the week, leaving the skin with a parchment-like shrivelled appearance (due to a loss of its elasticity), and with a greenish-yellow discoloration.

Many modifications of the eruption are seen, even in an attack of simple scarlet fever; and to these special names have been given. e.g. -

Scarlatina Laevis. - This term is applied to the form of eruption seen in the ordinary attack of the disease.

Scarlatina Laevigata. - This has been described by Canstatt (See Mayr., p. 195) as a more marked form of the preceding variety. The puncta are somewhat broader, and, reflecting the light, give a peculiar glossy appearance to the rash. He also states that, in this form, the mucous membranes are more apt to be involved.

Scarlatina Papulosa. - Here the puncta are more marked, owing to the greater infiltration and exudation. They are of a dark red colour, and can be more easily felt than seen. According to Mayr (p. 196), these sometimes appear twelve to eighteen hours before the ordinary scarlatinal rash.

Scarlatina Miliaris. - (Scharlach Friessel) - In this form a number of small vesicles appear, especially on the chest and back, though they may also be seen on the back of the hands, the wrists, the forearms, and the legs. They contain a white fluid with an alkaline reaction. This form is frequently seen when there has been profuse perspiration (Eichhorst, IV, p. 256), but it may occur without this. In some cases the rash may consist of large, irregular, slightly-raised maculae, more or less resembling those of measles. When declining, serous fluid may be poured out between the rete and the epidermis, especially upon the trunk, so that the surface is covered with small flat blebs, which may be umbilicated, or resemble pemphigus, and having a tendency to run together.

Scarlatina Variegata.- In this form the eruption isdistributed in an irregular manner, very like the exanthem of measles. The puncta are of an intense-red colour, much darker than usual, whilst the rest of the rash is much paler. Sometimes these macules coalesce. According to Henoch (Vorles, p. 650), this rash is of unfavourable omen, but this does not always appear to be the case.

In some mild cases we see small haemorrhages occurring with the eruption, especially near joints. These must not be confounded with the true haemorrhagic form of the disease.

During the stage of eruption, the mucous membrane of the cheeks, soft palate, and gums are swollen, and the rash, which first develops in the mouth, will have reached its maximum at the beginning of this stage. The lips are swollen and dry, the angles of the mouth become fissured, and the surface of the lips is apt to become covered with crusts, often of a dark colour, due to extravasated blood.

The Tongue.- The redness at the edges and tip of the tongue increases in area, and the grayish-white covering peels off, the region of the circumvallate papillae being the last to clear. The fur is easily removed by friction of any sort. By the end of the second, or perhaps not until the fifth day, the tongue is completely denuded of its older epithelium. The fungiform papillae are very much swollen and injected, the circumvallate papillae are swollen also, but the filiform papillae have disappeared, and the organ will now be seen to be slightly swollen, glistening, and red in colour, with a smooth surface from which the enlarged fungiform papillae project. This condition, to which the term "red strawberry tongue" has been applied, is said to be pathognomonic of the disease; but in some cases, - and I have noticed a considerable number in the Swallownest Hospital, - never show it, and it may also occur in certain forms of glossitis. Sometimes the desquamation of the tongue is never complete, the posterior part remaining coated; and in occasional cases the peeling of the tongue may be limited to the tip, the edges, and a longitudinal strip down the centre, the latter often presenting a more or less ragged appearance.

The pharynx and tonsils present the same condition as seen in the preceding stage.

The Temperature (See charts 1, 2, 3, & 4). - As a rule, the temperature continues high during the period of eruption, showing the usual morning and evening remissions. It is usually about 104°F., and may remain at this for four or five days. In most cases it falls by lysis, and the first break comes about the sixth day of the illness. Sometimes the temperature does not reach more than 102°F., or it may be even less, and the fall may be more rapid, approaching to a crisis with a subsequent subnormal

temperature.

Sometimes the temperature rises and falls in a ladder-like manner, as in enteric fever, and in such cases Vogl has noticed the maximum to be reached in three or four days.

In 175 cases, Henoch noticed 4 with a normal morning temperature, but a high evening rise; and Litten, who has seen the same, observed an afebrile course to follow a high initial temperature.

Jamieson, in his report of 200 cases to the Edinburgh Medico-Chirurgical Society, gives the maximum temperature as occurring -

In	11	cases	on the	first day.
"	76	"	"	second "
"	75	"	"	third "
"	36	"	"	fourth "
"	2	"	"	fifth "

Berg (Med. Rec., 1904, ii, p. 1) says the temperature is very high, often reaching the highest point attained at any time during the illness, at the time of the development of the enanthemata, and synchronous with the vomiting and sore-throat. As a rule, the rash appears within the first day or two, frequently within six or eight hours. During the period whilst the eruption is spreading, the temperature remains high, often keeping at its highest point for three or four days. According to him, the first slight decline is noticed when the eruption reaches the legs, and when once begun, the temperature continues to fall by lysis, and the normal is reached within five to eight days.

As a rule, the height of the temperature indicates the intensity of the attack, but again, many of the most malignant forms of the disease are associated with a low or even subnormal temperature.

The pulse is rapid throughout this period of the illness, and is more so than the height of the temperature would suggest.

The lymphatic glands, especially those at the angle of the jaw, are swollen, easily palpable, and frequently tender on pressure. The spleen is also enlarged.

The urine shows the usual changes of a febrile disease, being scanty and high coloured. When the rash has reached its height, - i.e., on the third or fourth day, - the excretion of urea begins to diminish. There may also be febrile albuminurea, which may begin on the second or third day, and lasts until the sixth or seventh. Binet found albumen in 34 cases out of 43; and, according to Stevenson, it occurred in 60 per cent. of all his cases. Eisenschitz considers albuminuria to be an essential symptom of scarlet fever, just as the cough is essential to measles. Peptonuria has been said to occur. As a rule, the urine contains no casts or blood-corpuscles, but occasionally a few dead epithelial cells are seen.

During this stage there is a loss of appetite, constant thirst, and either somnolence or delirium, or restlessness with more or less nervous manifestations - e.g., tremulous limbs, etc. The mouth and throat are dry, and the patient frequently complains of a tickling or pain in swallowing. In many cases the eruption causes more or less itching, burning, or smarting, and so increases the restlessness of the patient. The bowels are, as a rule, constipated, but sometimes diarrhoea occurs, and should not be looked upon as a grave symptom, unless very severe. In some cases of only moderate severity, the urine and faeces may be voided involuntarily.

The respiratory system, as a rule, shows no abnormal condition; but the dryness of the throat may cause a short, dry, hacking cough.

IV. THE DESQUAMATIVE STAGE.

At the beginning of this stage the temperature shows a gradual fall, or it may have become normal. The pulse-rate also falls, but not usually until some two or three days after the temperature. We notice a great alteration in the condition of the patient, - the thirst disappears, the appetite returns, the tonsils become much

smaller, swallowing is not painful, the tongue is covered with epithelium, and sleep is prolonged and refreshing. The lymphatic glands slowly return to their original size, the urine is not albuminous, and shows no febrile condition, the blood becomes richer, and at the end of two weeks or so the patient feels so well that he is only kept in bed with the utmost difficulty.

When the rash has disappeared, we notice a shedding of the epidermis (desquamation), which usually begins where the eruption first made its appearance - i.e., at the point where the eruption first began to fade - viz., on the neck and upper part of the chest. According to some observers, the earliest sign of desquamation is seen on the face, as a thin powder, as if it were dusted, upon the flushed cheeks, giving an appearance as if the parts had been first rouged and then powdered. According to them, it may be seen on these parts as early as the second day of the rash, and, as a rule, it occurs as a fine powder, though in many cases it may be coarser - i.e., furfuraceous, and is frequently best seen on the lobules of the ears, the eyelids, the muco-cutaneous junction of the lips, and on the frontal prominences. It is usually well marked around the margin of any recent cicatrix or scab. In many cases desquamation is seen on the neck and trunk whilst the legs are covered with the rash.

In different cases the desquamation varies according to the intensity of the attack, the histological structure, and individual peculiarity of the skin, and in those whose skins are very tender, it is apt to be attended by intense local symptoms.

It usually begins as a circular elevation, very much like a vesicle, at the site of the puncta. This elevation consists of a dried epithelium, in which a small hole (pinpoint) is seen to form. These holes become larger and larger, extending in circles, and spreading in all directions, so that in joining others, the whole of the old skin is shed. In some cases it begins as a fissure, and then the skin is apt to resemble the condition known as ichthyosis. This, however, is not so common.

It is said that desquamation may occur in cases in which there has been no rash, but this is disputed. A case of this description occurred in the Swallownest Hospital, the patient being a nurse. I have reported it on page 106. Henoch (Charité-Annalen, Bd. 3, S. 557) says:

"I have never seen the desquamation of the epidermis take place, except as the result of a more or less fully developed exanthem. In two cases of scarlatina sine exanthemata there was absolutely not a trace of desquamation perceptible".

As a rule, an intense rash is followed by early, prolonged, and copious desquamation, whereas, in a case showing a slight rash, the reverse occurs. I remember attending two sisters who were suffering from the disease, the elder had a slight rash, which was followed by very slight peeling, - on the hands and feet only; the younger had a copious eruption, which was followed by plentiful desquamation. In the majority of cases where the original puncta are well marked, and when the general symptoms are severe, the better marked will be the desquamation.

The character of the desquamation varies with the locality: on the scalp, the face, the neck, the trunk, the groins, the axillae, and the inner side of the upper arm, the scales are small, fine, and flaky (desquamatio furfuracea), resembling, in a great degree, the branny desquamation of measles; whilst on the legs, and the arms, and especially on the hands and feet, the skin strips off in shreds, or is pulled off in a long membrane (desquamatio membranacea). In some cases a strip the length of the forearm has been noticed.

On the hands and feet it usually begins last, and is first seen just under the nails - i.e., at the point where they are most firmly attached, though on the former it may commence first on the ball of the thumb. Sometimes a dry and chalky appearance of the palms of the hands and the soles of the feet is seen instead of desquamation; whilst, on the other hand, casts of the fingers and toes, or even of the whole hand, are not uncommon. The presence of desquamation, either membranaceous or furfuraceous, on the hands or feet, warrants one in assuming the previous

existence of scarlet fever, no matter what history is obtainable.

All the epithelial tissues are affected during the desquamation; the hair breaks off, the nails may be shed, but usually they show a transverse groove, frequently of dotted appearance, at the same point on several of them. This groove is first seen during the third week, and reaches the distal end of the nail in the fourth or fifth month. It was first observed by Wilks, but is not peculiar to scarlet fever, as it occurs in many acute diseases, though it might be a help to diagnosis in doubtful cases. Frequently the growing teeth are more or less affected, showing a tendency to early decay, - a change due to deficiency in the enamel, or to an affection of the deeper structures.

In some cases the desquamation is so very slight that it must be looked for very carefully before it is detected, and in those with thin skins, and in infants, whose skins are soft and flabby, it is often so slight and transient as to be overlooked. In mild cases it may only be found on the palms of the hands, and the soles of the feet, and then frequently only very late; and, according to Jenner, it may be seen upon the nails.

As mentioned before, it may occur even before the rash has completely disappeared, in other cases, not for a few days, or for two or three weeks; whilst Thomas states that, in rare cases, it may not take place for several weeks, - a statement lacking confirmation. As a rule, it is well marked on the neck, the chest, and the inner surface of the arms by the end of the first week, and by the end of the second, it has become more or less general, though it may be delayed on the hands and feet until long after the rest of the body is clear.

The length of the desquamative stage varies, and, as stated before, it is usually longer in those cases presenting severe initial symptoms followed by a copious and intense rash. Different authorities give different times; but, in the majority of cases the body is clear

usually in four weeks, though on the hands and feet, where the epidermis is thicker, it usually takes two to three weeks longer, and may even be prolonged to twelve weeks. As a general rule, we may see it finished in from six to eight weeks, although in some cases it may last as long as three or four months. Unterberger gave the time as from two to five weeks, Thomas from several days to several weeks; Barthez and Sanné consider the average to be from one to three weeks, whilst Bohn says it lasts two, four, six, and eight weeks.

McCollom (Boston City Hosp. Rep., S. 10, 1889, p.32) in 1000 cases found the average duration of the desquamative stage to be fifty days. Redesquamation may occur, but, as a rule, it is only partial. McCollom noticed a small number of secondary and a few cases of tertiary desquamation, whilst other writers have reported cases where it has occurred four or five, and, according to Thomas, even six times.

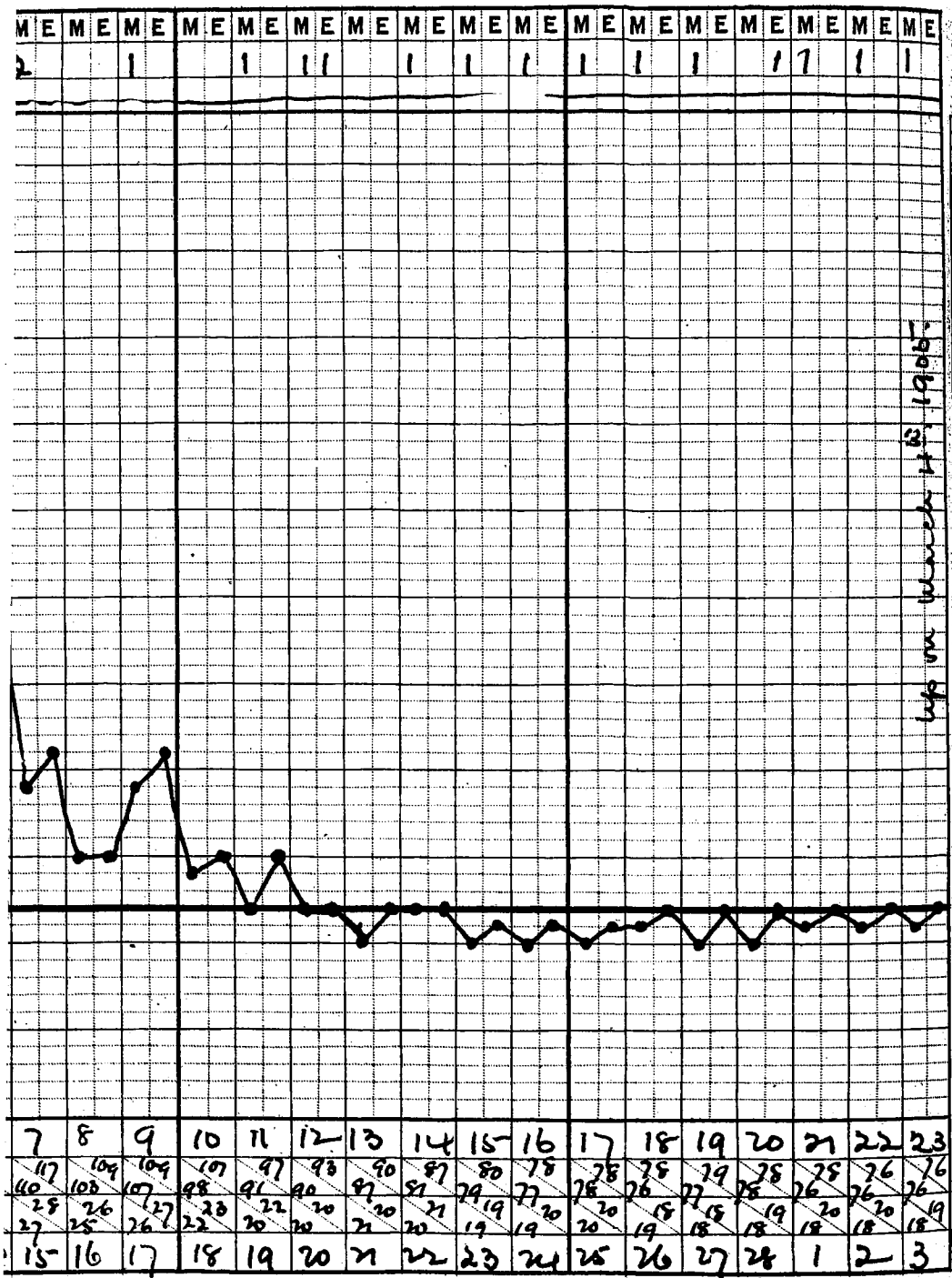
Caiger (Allbutt's System of Med., Vol. 2, p. 145) says excessive sweating sometimes occurs after desquamation is finished, and is best marked on the hands and feet. These parts are apt to be bathed in perspiration, not only during sleep, but under the stimulus of the slightest mental excitement. In adults it has a great tendency to persist long after the cessation of the desquamation.

We must regard the patient as infectious as long as one single piece of dead epithelium remains.

In simple scarlet fever, the prognosis is good, the disease runs its course, and at the end of the desquamative stage the patient is quite well.

CASES AND CHARTS.

Case I. - Harry Fotheringham, aged 20 years, of strong constitution, first seen on the morning of February the 10th, 1905, gave the following history: The previous evening he was suddenly seized with severe frontal headache, sore-throat, pains in the limbs, and a



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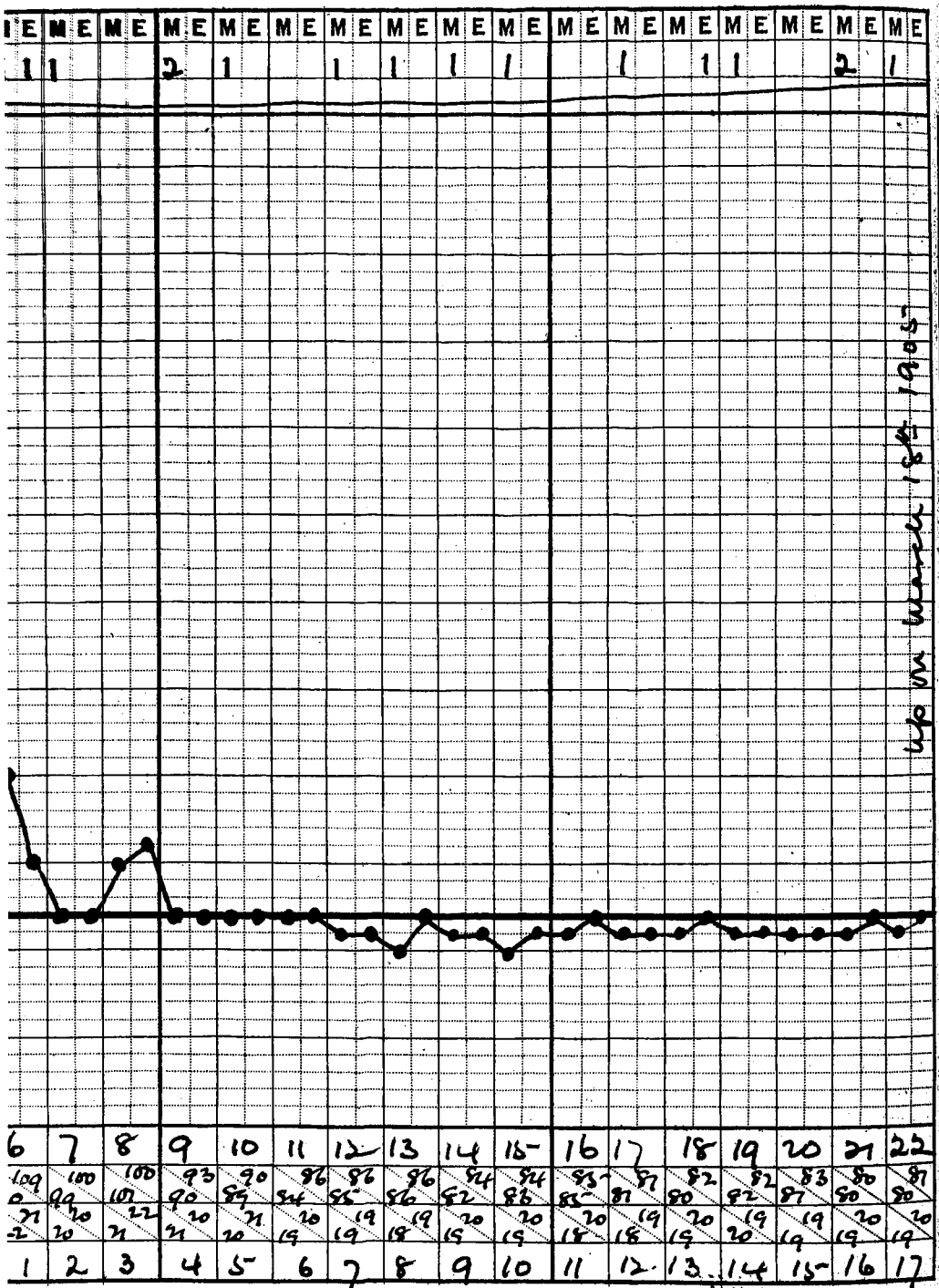
Clinical Chart.

sense of chilliness. At my visit, at 11 a.m., I found the temperature to be 102°F., pulse 118, of good volume. Respiration 28. No rash. He complains of great difficulty in swallowing, and the tonsils were swollen, with small follicular ulcers showing on their surface. The anterior pillars of the fauces were swollen and injected. The tongue was covered with a dirty-white fur, and the bowels were constipated. The submaxillary glands were slightly enlarged. This was the first of the two cases which occurred in the village where I reside, and, as influenza was epidemic in the district at the time, the case was thought to be one of the prevailing disease.

Next morning (February 11th), at 11 a.m., I found the temperature to be 102.8°F., pulse 120, and respiration 29. A well-marked scarlatinal rash was seen on the neck, arms, and trunk, but none on the face, and only slightly marked on the legs. The patient said it came out early on the evening of the previous day. He now complained of great pain in swallowing, and on moving the jaw, and the submaxillary glands were easily palpable and tender to the touch. The ulcers on the tonsils had not coalesced, and the tongue was not typical of the disease. He was removed to the hospital the same afternoon. On February the 12th, the rash was well-marked on the legs, otherwise his condition was unchanged. On February the 13th, he still complained of severe sore-throat, which on examination appeared to be unaltered; the tongue was still dirty and atypical. On February the 14th, he felt better, had a much better night, the throat did not feel so sore, and the rash is beginning to fade on the chest. On February the 16th, the desquamation was seen on the neck. On February the 18th, the rash had completely disappeared. From this time onwards no symptom of any importance interfered with his convalescence. He was allowed out of bed on March 4th, 1905, and discharged on April 4th, 1905, after a stay of 52 days' duration in the hospital.

Case II. - Percy Wright, aged 5 years, first seen on the evening of March 10th, 1905. According to the mother, he commenced that morning with vomiting and feverishness, and on my visit I found the temperature 101.8°F., the



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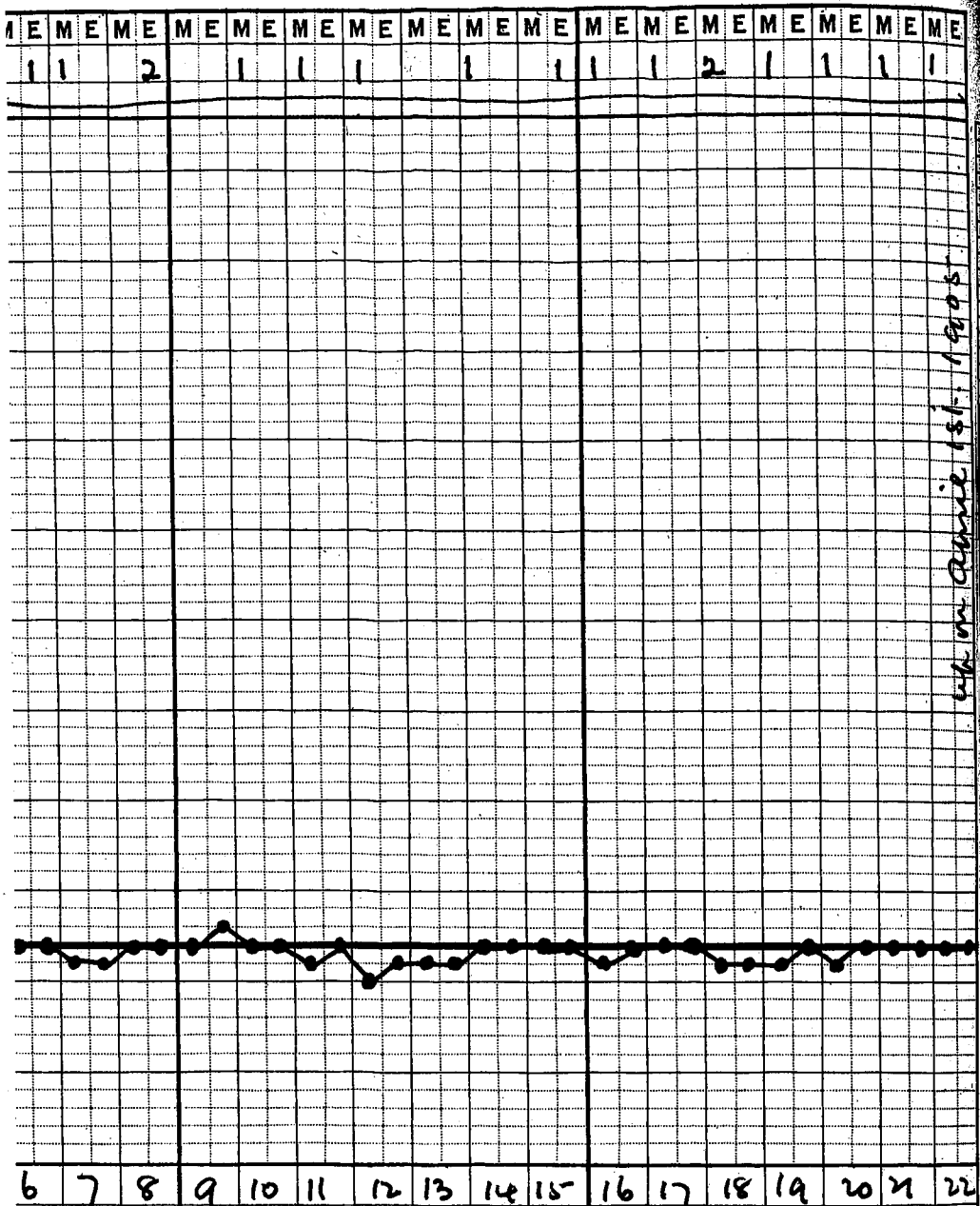

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Gould's Clinical Chart

6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22

109 100 100 93 90 86 86 86 84 84 85 87 82 82 83 80 87

0 99 101 90 89 84 85 86 82 86 85 81 80 82 81 80 80

21 20 22 21 20 21 20 19 20 20 20 19 20 19 19 20 20

2 20 21 21 20 19 19 18 19 20 18 18 19 20 19 19 19

1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17

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Gould's Clinical Chart

pulse 129, and the respiration 30. The tongue was covered with a whitish fur, the bowels were constipated, and the throat was slightly injected, and the tonsils swollen. The submaxillary glands were slightly enlarged. There was no rash. On the morning of March 11th, I found a faint pink rash over the whole body including the face. The temperature was 102°F., the pulse 130, and the respiration 30. The tongue showed the typical white strawberry colour, the throat was injected, but there was no coating on the tonsils. The submaxillary glands were enlarged and tender. He was removed to the hospital the same afternoon.

March 12th. - Complains of his throat being painful, but otherwise about the same.

March 13th. - Rash is fading. Typical red strawberry tongue.

March 14th. - Desquamation noticed on the face and neck.

March 15th. - No trace of the rash. Further course uneventful. Patient up on the first day of April, and discharged on May 7th, 1905, after a stay of 56 days in the hospital.

In this and the preceding case the source of the infection could not be traced.

Case III. - Albert Brearley, aged 10 years, admitted to hospital on February 25th, 1905. The rash was well developed over the whole body except the face. The throat was sore, the tonsils swollen and covered with follicular ulcers, and the submaxillary glands were enlarged and tender to the touch. The tongue showed the white strawberry colour, and the bowels were constipated. According to the history, he began suddenly with fever, vomiting, and sore-throat on February 23rd, and the rash was first noticed on the next day.

February 26th. - The tongue had now desquamated and was typical.

March 1st. - The rash was now fading, and had disappeared on March 4th. Desquamation was first noticed on the neck on March 7th. He was up on March 18th, and

discharged on April 22nd, 1905, after being 49 days in the hospital.

Case IV. - Arthur Rowley, aged 14 years, a very delicate looking lad, was admitted on December 26th, 1904, with a well marked rash on the body and legs, but none on the face. A brother died a few days ago in the hospital from malignant scarlet fever, and another is in the hospital with the septic form of the disease. The rash came out on December 25th, 1904.

On admission the temperature was 101°F., the pulse 120, and the respiration 27. The throat was very red and inflamed, both tonsils showing a well marked follicular ulceration. The submaxillary glands were much enlarged, and tender, swallowing was difficult and painful, and the patient had a typical red strawberry tongue.

The rash began to fade on December 31st, and three days later had disappeared. Desquamation was first noticed on the neck on January 1st. The temperature did not reach the normal until the 9th, and no cause could be found for the slight exacerbation which was observed on January 14th, 17th, and 18th. Peeling was long delayed on the feet; he was allowed to be up on January 27th, and discharged on February 25th, 1905, having been 61 days in the hospital.

B. SEPTIC SCARLET FEVER - SCARLATINA ANGINOSA - SCARLATINA ULCEROSA.

This form of the disease is much more common in children than in adults, and is characterised by a septic condition of the throat. Usually the initial symptoms are well pronounced, and the fauces are involved, in a great degree, from the beginning of the illness, but occasionally the case may, at first, present symptoms of an ordinary attack of the disease, followed by, in a few days, severe throat symptoms, which appear to be added to the ordinary attack. As a rule, these cases are associated with high and continued fever, great prostration, and profound nervous manifestations.

The stage of invasion is characterised by most profound symptoms, - the skin is very hot and dry, the urine is scanty, high coloured, and usually contains albumen. The fever is high, as shown by the temperature which reaches 104°F. or 105°F. or even higher, an extremely rapid pulse, showing a rate of 120 to 150 or 160 beats per minute, and in severe cases being so rapid as to be counted only with very great difficulty. Vomiting is a common and very troublesome symptom, and the bowels are frequently very loose. The headache is intense, deglutition extremely painful and difficult, whilst restlessness, delirium, and convulsions are often well marked, especially in children. The patient has anorexia, and the thirst is unquenchable. The tonsils, the mucous membrane of the soft palate and of the fauces quickly become oedematous and inflamed, and are soon covered with mucus, which, in some cases, may be loose, in others, sticky and tenacious.

The Eruptive Stage. - The rash, which usually appears a few hours after the commencement of the first symptoms, is frequently intense, of a dusky red, or even purplish colour, and whilst showing a marked tendency to stain the tissues, is frequently associated with the formation of petechiae (haemorrhages). In some cases it may be rudimentary and sparse; in others very blotchy, especially upon the extremities; these blotches, which are irregular in outline and of various sizes, may disappear from one part of the body, only to reappear on another. On the back of the hands and the dorsum of the feet, the rash is frequently of a very deep livid hue. The temperature remains high, 104°F. or more, the pulse becomes quicker, and all the other symptoms increase in severity. The constitutional depression is more marked, the headache intense, the delirium more active, and the sore-throat even more pronounced.

The tonsils now become covered with a dirty grayish membrane, which may extend on to the uvula, resembling to a great extent, but quite different from,

that occurring in diphtheria. Sometimes well-marked areas of necrosis are seen in the tonsils, and the swelling of the parts about the pharynx may be so extreme as to impede respiration; whilst at the same time swallowing increases in difficulty, even liquids being taken with great pain. The tongue, which shows the typical red strawberry appearance, is very dry, often looking like raw beef, the breath is offensive, and in many cases, vomiting is such a distressing symptom that it is often a very difficult matter to keep up the strength of the patient, as owing to the irritability of the stomach, everything is rejected. Frequently it is almost impossible to examine the throat properly, owing to the accumulation of viscid mucus in the mouth.

The temperature, instead of falling gradually to the normal at the end of the first week, keeps high for the first few days, remaining at or about the same level, and then becomes irregular and intermittent, the daily variations becoming more and more pronounced as the septicaemic process increases. The urine is scanty in amount, contains albumen, whilst blood and epithelial and hyaline casts are frequently seen under the microscope.

The sloughing of the tonsils and adjacent parts is now followed by ulceration, which especially affects the angles between the uvula and the arches of the palate, though it is frequently seen on the faucial pillars and over the whole of the soft palate. When the swelling has been excessive, necrosis "en masse" of some or even all of these parts may occur - e.g., the uvula, one arch, or even the whole of the soft palate, one or both tonsils may be involved in the gangrenous process and slough away, whilst in other cases the gangrene may be more localised. The sloughing may be so extensive and deep as to involve the blood-vessels, causing fatal haemorrhage. Sometimes the local processes on the anterior pillars of the fauces at their junction with the mucous membrane of the mouth, may take on perforations of varying size. When large these may cause a loss of part of the pillar, and when smaller and recovery takes place, there is more or less shrinking;

consequently it may be difficult to localise the size of these perforations, especially those which have been reduced to a pin-point.

The neighbouring lymphatic glands are involved in the process; they are enlarged, tender on pressure, easily palpable, and frequently show signs of suppuration. They are liable to a low form of periadenitis, which, extending into the cellular tissue, causes much infiltration. This is followed by inflammatory processes, so that the parts become hard, red, tense, and brawny, with many small foci of suppuration. When both sides of the neck are affected, the whole space between the jaw and the sternum and clavicles is filled up as it were, by a collar, giving the appearance known as "bull-neck". The skin here becomes of a bluish tint, small blebs appear, which burst, and discharge a thin purulent fluid, often of a very offensive character. When incised the tissues feel quite leathery, and a thin, blood-stained discharge exudes, which is extremely irritating to the surrounding tissues. The skin is undermined to a greater or less extent, much sloughing is seen amongst the subcutaneous tissue, and on the separation of these sloughs, the deeper structures are frequently laid bare. In many cases the destruction extends so deeply that fatal haemorrhages may occur, due to erosion into the blood-vessels, more frequently into a vein than into an artery.

The tongue at the end of the first week becomes covered with a dirty yellowish fur, and in many cases aphthous patches or superficial ulcers are frequently seen upon the gums, the tongue, and the buccal surface of the cheeks and lips. The breath is very offensive and foetid, the angles of the mouth are fissured and sore, and the lips and teeth are covered with sordes.

The changes in the pharynx may involve the naso-pharynx and Eustachian tubes, and when it extends to the former, a muco-purulent, or a thin sanious discharge comes down the nose, which in some cases may be blocked.

The latter form of discharge is extremely irritating in character, causing much excoriation about the nostrils. When the process extends to the Eustachian tubes, one or both ears may become involved, leading to suppuration, perforation of the tympanic membrane, and consequent discharge of pus through the external auditory meatus. When the patient attempts to drink, the liquid frequently returns through the anterior nares, on account of the pharynx being blocked by the swollen and painful tonsils, or on account of the sloughing of the soft palate; and Watson has recorded a case where every time the child swallowed, liquid ran out of one of his ears. The patient may be troubled with a very irritating cough, due to the discharge from the broken down tissue running into the larynx, and in some cases leading to broncho-pneumonia, or bronchitis with profuse expectoration

The pulse, which was at first full, bounding, and regular, now becomes quick, smaller, and irregular, and often intermittent, the heart sounds are weaker, especially the first, and frequently at the end of the first week or the beginning of the second, it may be impossible to distinguish between the two sounds. Sometimes we hear murmurs at the different orifices, and acute dilatation of the heart has been recorded.

The patient suffers much from headache, and whilst some may have violent delirium, others will be apathetic, and remain in more or less of a stupor. The urine is diminished in amount, and very often, uraemic symptoms are noticeable.

Frequently, at the beginning of the second week, or perhaps a few days later, when the whole aspect is one of a most virulent septicaemia, the patient may take a turn for the better. The pulse becomes more regular, slower, and fuller, whilst the temperature gradually returns to the normal; but, although no more complications ensue, it may show a slight rise for two or three weeks. The cerebral symptoms show a marked improvement, but in cases where the depression has been well marked, the patient may be

slightly delirious at night for a few days. The urine increases in quantity, the ulcerative process in the pharynx subsides, the parts become"cleaner", and healing begins. As a rule, in these cases, desquamation does not commence until the third week, and taking a long time, is not complete until the end of the third month, or even later. Although, sometimes the patient has taken a turn for the better, he may sink from sheer exhaustion.

In other cases which do not show any improvement, the condition of the patient is most deplorable. Emaciation is extreme, the temperature becomes more and more irregular, the diurnal variations being more marked (as much as two or three or more degrees), and the pulse is more rapid, more feeble, and more irregular (in young children it may reach over 160). Deglutition is more and more painful, the breath more offensive, and the pharyngeal ulceration more pronounced. Respiration may be quick and short, or slow and laboured, and is frequently of the Cheyne-Stokes type; food may enter the larynx and trachea causing constant distressing cough, which prevents sleep, and leading frequently to bronchitis and broncho-pneumonia. Septic rashes, usually of a morbilliform character, occur on the buttocks, cheeks, and the extensor aspect of the larger joints, and as the strength fails, the patient passes into a state of profound depression (i.e., the typhoid state), with low muttering delirium, tremors of the muscles, constant picking at the bed-clothes, and finally becomes comatose, when partial or general convulsions may occur. There may be retention of urine, but, as a rule, both it and the faeces are passed involuntarily; and, just before life ends, a profuse diarrhoea may set in, accompanied by profuse perspiration, or perhaps lesions, such as pulmonary congestion or broncho-pneumonia.

In some cases, the temperature before death may rise to a considerable height, owing to a disturbance by the poison of the heat centres; in others, it may be low or even subnormal, with cold extremities, and symptoms of collapse.

DISEASE.

Septic Scarlet Fever.

Notes of Case.

Name Lizzie Kimberley.

Age 8 years.

Diet

Case Book No.

No. 5.

Date of admission.

September 17th 1904

Result Died Sept. 20.

Time.	M	E	M	E	M	E	M	E	M	E	M	E	M	E	M	E	M	E	M	E	M	E	M	E	M	E	M	E	M	E	M	E	M	E	M	E	M	E
Bowels.	1	2	4	2	3	1																																
Urine.	Trace of albumen.																																					

Temperature (Fahrenheit)

107° 106° 105° 104° 103° 102° 101° 100° 99°

Typhoid Sponge.

Normal Temperat. of body. 98° 97°

Day of Dis.	4				5				6				7																										
Pulse.	165				168				168				168																										
	163				164				170				Constable																										
Resp.	36		34		34		35		34		37																												
Date	Sept. 17				18				19				20																										

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CASES AND CHARTS.

Case V. - Lizzie Kimberley, aged 8 years, admitted on September 17th, 1904, at 11 a.m., with the following history: She commenced to be suddenly ill on September 14th, with sore-throat, and vomiting, and the rash appeared the next day. On admission to the hospital, she presented a well-marked rash, of a very dusky colour. The mouth was full of sticky mucus, the tongue was covered with a dirty white fur, and the breath was horribly offensive. The tonsils were greatly enlarged, the right one showing several small dirty gray patches, whilst on the left one was a large patch of the same colour. The pillars of the fauces, the uvula, and the soft palate were very oedematous, and she had a thick purulent nasal discharge. There was great difficulty both in breathing and swallowing. The temperature was 104.2°F., the pulse 163, thin and easily compressible, respirations 36, and the urine contained a trace of albumen. The submaxillary glands were enlarged and painful to the touch. She was very restless and delirious, and could be kept in bed only with great difficulty. The bowels were loose. The evening temperature was 102.8°F., the pulse 165, and the respirations 34.

September 18th. - The temperature was 101.2°F., pulse 164, respirations 34; very restless and delirious. Condition not improved. Bowels very loose. Evening temperature 101°F., pulse 168, respirations 35. Seems much worse.

September 19th. - Much weaker; temperature 101°F., pulse 170, respirations 34; is comatose and picks at the bedclothes. Urine and faeces passed involuntarily. Evening temperature 101.4°F., pulse cannot be felt so as to be counted.

September 20th. - Died at 1 a.m.; the temperature half an hour before death was 105.8°F.

Case VI. - Robert Hadfield, 6 years, admitted on December 20th, 1904. The initial symptoms appeared on December 17th; vomiting and sore-throat well marked, and

DISEASE.

Septic Scarlet fever.

Notes of Case.

Name Robert Hatfield

Age 6 years.

Diet

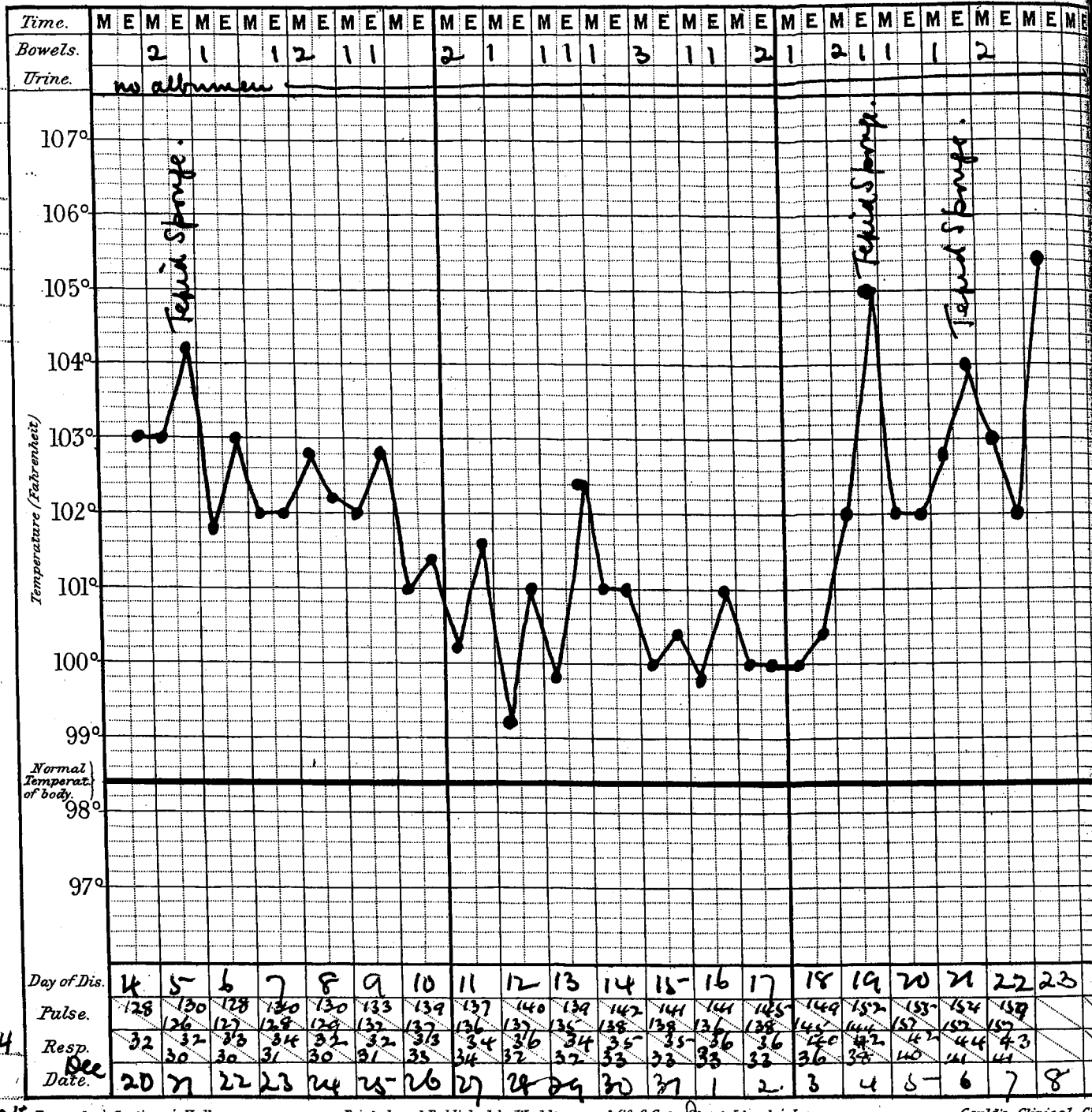
Case Book No.

No. 6.

Date of admission.

December 24th 1904

Result Died January 8th 1905



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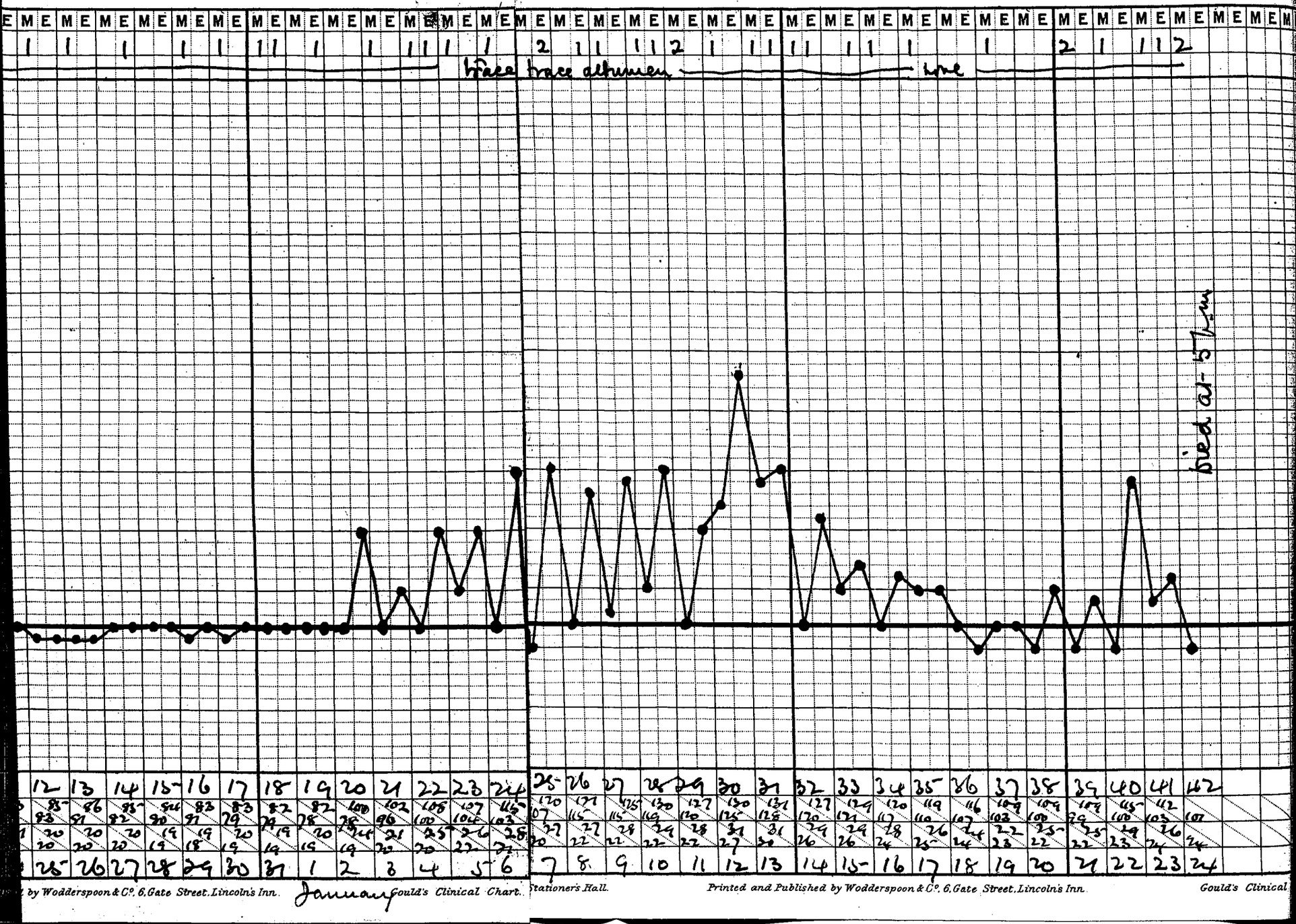
the rash appeared next day. On admission the temperature was 103°F., pulse 128, respirations 32; the bowels were constipated, and the urine contained no albumen. The rash was well marked all over the trunk and extremities, and was of a bright scarlet colour. The tongue was the typical white strawberry, the tonsils were swollen, and showed small follicular patches. The submaxillary glands were enlarged and tender on palpation.

December 21st. - Temperature 103°F., pulse 126, respirations 30. Throat is worse, the patches on the tonsils having run together; the tongue is clean, and typical of the disease.

December 22nd. - Breath very foetid, throat is sloughing, and there is a thin discharge from the nostrils. Submaxillary glands are much enlarged, and deglutition is very painful. The patient grew worse each day, the throat did not improve, and the foetor became more marked. Desquamation on the neck was seen on December 26th. Delirium was a marked symptom at night; the tongue became very dry and cracked, the skin around the nostrils was excoriated, sordes accumulated on the teeth, and the pulse became more rapid, weaker, and at last, intermittent. On the morning of January 4th, 1905, the temperature was 102°F., and in the evening 105°F. after a rigor. The patient finally became comatose, and died at 5 a.m. on January 8th, - the twenty-third day of the disease. The temperature half an hour before death was 105.4°F.

Case VII. - Percy Rowley, aged 18 years, admitted on December 17th, 1904. This was the first of the three brothers who developed the disease: one died from malignant scarlet fever, the other developed an ordinary attack.

The initial symptoms began on December 14th, 1904, with vomiting, sore-throat, and fever, and the rash appeared the next day. On admission to hospital, the body and extremities were covered with a bright red rash, the temperature was 103°F., pulse 128, and respirations 30.


Face trace alternans
Live
died at 5 p.m.

| | | |

The urine did not contain albumen, and the bowels were constipated. The tonsils were enlarged, and on both were seen dirty gray patches. The tongue was the typical red strawberry, and the submaxillary glands were enlarged and painful. I was present in the ward when he was admitted, and although he was not particularly robust, he seemed to one to have an ordinary attack of the disease. The rash began to fade on December 19th, and had disappeared two days later. Desquamation noticed on the neck on December 20th.

To all appearances he was well on the road to convalescence, there was nothing to remark about the symptoms, until the evening of January 2nd, 1905, when the temperature rose to 100°F. Next day it was normal, but on examination I found cellulitis in the subcutaneous tissue over the lower part of the right scapula. This suppurated and was incised. His condition now became one due to pyaemia; the temperature was low in the morning, with a high evening rise, the pulse became quicker and softer, and numerous boils broke out all over the body and extremities. He had profuse sweating, and seemed to be going from bad to worse, when an improvement set in. His temperature became much lower in the evening, and although the pulse was slower, it was still very weak. The heart sounds were not so distinct as normal, but there was no murmur to be heard. On the evening of January 22nd, the temperature again rose (100.8°F.), but was only 99.2°F. on the following evening, and normal on the morning of the 24th. In the afternoon he asked to use the bed-pan, and just after the nurse had attended to him, he was seized with symptoms of sudden collapse. The pulse could not be felt at the wrist, and in spite of every attention he died from cardiac syncope fifteen minutes later. No post-mortem examination could be obtained.

C. TOXIC SCARLET FEVER:

SCARLATINA MALIGNA: ATAXIC OR ADYNAMIC SCARLET FEVER.

This form of the disease, extremely rare in its occurrence, and fatal in its result, is due to an excessive dose of the scarlatinal poison, and must not be

confounded with the preceding form, which is due to a septic process superadded to the original lesion.

It may occur in adults as well as in children, and is characterised by an abrupt onset, severe initial symptoms, and a condition of the patient out of all proportion to the affection of the throat. In the most malignant form, the dose of the poison is so great that the patient dies before the characteristic lesions have had time to appear, and in such cases, death may occur in eight, fifteen, or twenty-four hours. The temperature is very high, reaching 106°F., or even more, and the patient is usually in a comatose condition, with suppression of urine.

In those cases not fatal at so early a period, the stage of invasion is marked by severe vomiting, which frequently persists throughout the course of the illness, diarrhoea, a high temperature, 105° or 106°F., and an extremely rapid and small pulse (140 to 180 beats per minute), which in many cases is irregular and intermittent. The respirations are quickened, and are often shallow and sighing, and in children, severe convulsions frequently occur at this stage of the disease. A rise in the temperature to 115°F. has been recorded.

The eruption which appears early, may be patchy and ill-developed, frequently disappearing in a few hours, or it may be general, and of a vivid scarlet or purplish hue. The pharyngeal symptoms may be only slight, the fauces not being markedly injected or oedematous, and as a rule, glandular enlargement and cellular infiltration of the cervical subcutaneous tissue are absent. In those cases where the pharyngeal lesions are pronounced, the intensity of the general symptoms masks the local processes. The face is dusky and cyanotic, the expression anxious, the tongue dry and brown, and the lips are cracked. The temperature remains very high, with slight or no remissions, the pulse becomes so rapid as to be almost uncountable, and the headache is intense. The patient becomes extremely delirious and restless; and in some cases convulsions may occur, or even tonic spasms, such as retraction of the head, or trismus; in others, the muscles

become tremulous, the mind is confused, and finally coma supervenes, the patient dying in from two to four or five days. Before death, the pulse becomes much more rapid and weaker, the urine is either scanty, high-coloured and albuminous, or totally supressed, and the temperature frequently shows a great rise just before the end.

In the ataxic form the temperature is high, the pulse is rapid, soft, and irregular, the respirations are quickened and frequently shallow, and the constitutional depression is extreme. The tongue is usually dry and cracked, the bowels are loose, and the urinary secretion either diminished or supressed, whilst toward the end of the disease the faeces may be passed involuntarily. Delirium, which is usually low and muttering, is followed by coma, and in some cases, death is preceded by convulsions. In this form of the disease, the scarlatinal poison acts directly upon the nerve-centres.

In the adynamic form, the prostration and the muscular weakness are extreme. The temperature is high, perhaps not abnormally so, the pulse is small, weak, and easily compressible, and there may be more or less stupor from the beginning of the illness. The tongue is dry and brown, the lips are parched, whilst vomiting and diarrhoea are early and prominent symptoms, frequently persisting to the end. Feeding is often an extremely difficult matter, as everything is rejected by the stomach. The eruption may not be abnormally developed. The state of the patient becomes worse day by day, the constitutional depression increases, the muscles become tremulous, frequently showing fibrillary contractions, there is jactitation, picking of the bed-clothes, and delirium during sleep. Bed-sores now form on those parts exposed to pressure, and the patient passes into a typhoid state, with involuntary passage of the excreta, and a subnormal temperature before death.

The haemorrhagic form is seen usually in young children, between the ages of one or two years, especially in those who are ill developed, and badly nourished, and

although it is, as a rule, fatal, it is said that recovery may take place in the milder forms of the disease. According to German writers, it is less frequently seen in their country than in ours.

This form of the disease is characterised by the occurrence of haemorrhages, and, according to Thomas (v. Ziemssen's Handb., Bd. 2, S. p. 297-298), the eruption, as a rule, is imperfectly developed and irregular in its distribution. It is of a dark hue, frequently petechial in character, and has a tendency to stain the tissues. The haemorrhages, which vary in size from a small point to a hemp seed, appear on the whole or part of the body. They come out at intervals for several days, are circumscribed, and of a deep red or purple colour. Frequently they coalesce, and appear as large purple ecchymoses. Petechiae may also appear on the gums, from which blood often exudes. Epistaxis is of very common occurrence, and there may also be haemorrhages from the urinary passages, the bowels, or the vagina; whilst internally they may be noted as occurring in the brain, the liver, the spleen, the stomach (haematemesis), the lungs (haemoptysis), and even in the pleural and pericardial sacs. The subcutaneous tissue of the neck is often haemorrhagic, whilst severe bleeding may occur from a leech-bite, tooth cavity, or a cupping wound.

The face is bloated, the fever is severe, and the cerebral symptoms are well marked. The skin at the beginning of the attack is red and erythematous, but becomes shrivelled and flabby; and, as a rule, the throat symptoms are severe, often leading to sloughing, ulceration, and gangrene, accompanied by infiltration of the cellular tissues of the neck. The pulse is weak, rapid, and soft, the respirations are increased in frequency; and usually death occurs, with all the symptoms of intense collapse, within twenty-four hours of the commencement of the illness.

DISEASE.

Malignant Scarlet Fever

Notes of Case.

Name Samuel Hall

Age 23 years.

Diet

Case Book No.

No. 8 (a).

Date when first seen. *of Admission.* November 20th 1898

Result Died Nov. 22. 1898

| *Time.* | M | E | M | E | M | E

DISEASE.

Malignant Scarlet Fever

Notes of Case.

Name John Rowley

Age 12 years.

Diet

Case Book No.

No. 8.

Date of admission.

December 22. 1904

Result Died December 24

Time.	M	E	M	E	M	E	M	E	M	E	M	E	M	E	M	E	M	E	M	E	M	E	M	E	M	E	M	E	M	E	M	E	M	E	M	E	M	E
Bowels.			1																																			
Urine.	no albumen.																																					
Day of Dis.	3		4		5																																	
Pulse.	158		160		169																																	
Resp.	33		32		36																																	
Date	Dec		22		23		24																															

Temperature (Fahrenheit)

107° 106° 105° 104° 103° 102° 101° 100° 99° 98° 97°

Normal Temperat. of body.

Typhoid Stupor

Typhoid Stupor

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CASES AND CHARTS.

Case VIII. - John Rowley, aged 12 years, was admitted to the hospital on December 22nd, 1904, withthe following history. The initial symptoms began on December 20th, and the rash appeared on the next day. On admission the temperature was 104°F., the pulse 158, and the respirations 33. The rash was copious, of a dusky red colour, and petechiae were noticed in places - especially upon the legs. The throat was injected, and the tonsils swollen. The submaxillary glands were only slightly enlarged. The tongue was dry and red, and the papillae were well marked. The patient was extremely restless and very delirious. The bowels were constipated, and the urine contained no albumen.

December 23rd. - The patient is worse, although the temperature in the morning was 102.2°F. The pulse was weaker and more rapid, and the delirium more marked. Towards evening he became comatose, and died at 3.15 a.m. on December 24th. The temperature before death was 106.8°F.

Case VIII (a).- Samuel Hall, aged 23 years, was first seen on the evening of November 20th, 1898. He was delirious, temperature 103.8°F., pulse 128, respirations 30. The tongue was dry and covered with a dirty gray fur, but the papillae were prominent; the throat was injected, and the tonsils swollen, and each showed a few gray patches. The rash which was well marked was of a dusky red colour. The urine was scanty, high coloured, deposited lithates on cooling, and contained a trace of albumen. The bowels were constipated. According to the history, he began on the morning of November 19th, with sore-throat, headache, pains in the limbs and feverishness, and the rash came out clearly on November 20th.

November 21st. - Had a very bad night; was very delirious and restless, and could be kept in bed only with very great difficulty. In the morning the temperature was 104.2°F., pulse 133, respirations 30. Throat about the same, and the tongue was very red, with prominent papillae (red strawberry), and dry. Evening temperature was 105°F., pulse 146, and respirations 32. Has passed very little urine, and is unconscious.

November 22nd. - Much worse, the temperature 104.6°F., pulse 152, and respirations 32. The urine is suppressed. Is comatose; death occurred at 8.30 p.m., and was preceded by convulsions. The temperature before death was 107.2°F.

D. IRREGULAR FORMS OF SCARLET FEVER.

I. SCARLATINA SINE EXANTHEMATA - SCARLATINA SINE ERUPTIONE.

This form frequently occurs amongst those who nurse the disease, or who have suffered from a previous attack, and is characterised by sore-throat (as a rule, not severe), and by slight feverishness, the temperature rarely rising above 101°F., and being of short duration.

Most observers, whilst agreeing as to its occurrence, hold different views as to its frequency, the majority saying it is very rare. Indeed Fürbringer looks upon it as almost a clinical curiosity.

According to Henoch (Charité-Annalen, III, Jahrgang, 1876, p. 553, Mitth. ueber das Scharlachfieber, und Vorlesung (loc. cit. p. 861)), many cases of scarlet fever occur in which the eruption is so sparse and of so light a colour, that it is not recognised as such, and the diagnosis is only made on the appearance of the desquamation, or some other complication, such as nephritis. He considers absence of eruption to be very rare.

Thomas (p.251) thinks it is wise to be suspicious of every case of sore-throat occurring during an epidemic of scarlet fever, and frequently its true nature will be revealed by the occurrence of desquamation, or perhaps dropsy.

Mayr (p.195) would only diagnose this form of the disease when occurring in the members of a family, some of whom have had an attack of scarlet fever, and when

DISEASE.

Scarlatina Sine Exanthemata.

Notes of Case.

Name Nurse Smith.

Age 22 Years.

Diet

Case Book No.

No. 9.

Date of admission.

November 22. 1904

Result Recovery

January 6th - 1905

Time.	M E	M E	M E	M E	M E	M E	M E	M E	M E	M E	M E	M E	M E	M E	M E	M E	M E	M E	M E	M E	M E	M E
Bowels.	1	1		2	1	1		1	1			1	1	1		2						
Urine.	No albumen																					
Day of Dis.	1	2	3	4	5	6	7	8	9	10	11	12	13	14								
Pulse.	96	99	95	90	91	82	88	80	87	81	80	78	77	73	72	73						
Resp.	23	23	22	21	21	20	20	19	19	18	18	18	19	18	18	18						
Date DEC	22	23	24	25	26	27	28	29	30	1	2	3	4	5								

Temperature (Fahrenheit)

107° 106° 105° 104° 103° 102° 101° 100° 99° 98° 97°

Normal Temperat. of body.

up in December 6th 1904.

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attended by sore-throat, fever, and desquamation. I have repeatedly been anxious about the diagnosis of cases occurring in my practice when, in addition to sore-throat and fever, I have received a history of a pin-head rash, which was only noticed by the friends of the patient for a few hours, and had disappeared before my visit. A few months ago, I attended a child with such a history, and although I quarantined him for four weeks, there was no desquamation.

I have been fortunate enough to have had the opportunity of observing one case of this form of the disease.

CASE AND CHART.

Case IX. - Nurse Smith, aged 24 years, a probationer, had been in the scarlet fever wards for 3 months. She says she has never had an attack of the disease, and was quite well up to November 21st, 1904; but on the morning of November 22nd, she was unable to go on duty. She complained to the matron of sore-throat, and aching pains in the limbs. Her temperature was 101°F., pulse 96, respirations 23, the bowels were constipated, the urine deposited lithates on cooling, but did not contain any albumen. The tongue was coated with a grayish-white fur, no enlarged papillae, and although the throat was slightly injected, the tonsils were not swollen. No enlarged glands could be felt, and there was no rash to be seen. I ordered her to be sent to the isolation wards.

November 23rd. - The temperature was 101°F., pulse 95, respirations 22. The throat looks the same, the submaxillary glands are slightly enlarged, tongue the same, no rash.

November 24th. - The temperature 100°F., pulse 90, respirations 21. Throat feels much better, tongue still coated, no enlarged papillae, no rash.

November 25th. - Temperature 98.6°F., pulse 82, Respirations 20. Feels much better.

The temperature remained at, or about, the normal, no rash was seen, although looked for daily, and the

DISEASE.

Scarlatina sine
Angina et sine
Exanthemata.

Notes of Case.

Name Clifford Todd.

Age 9 years.

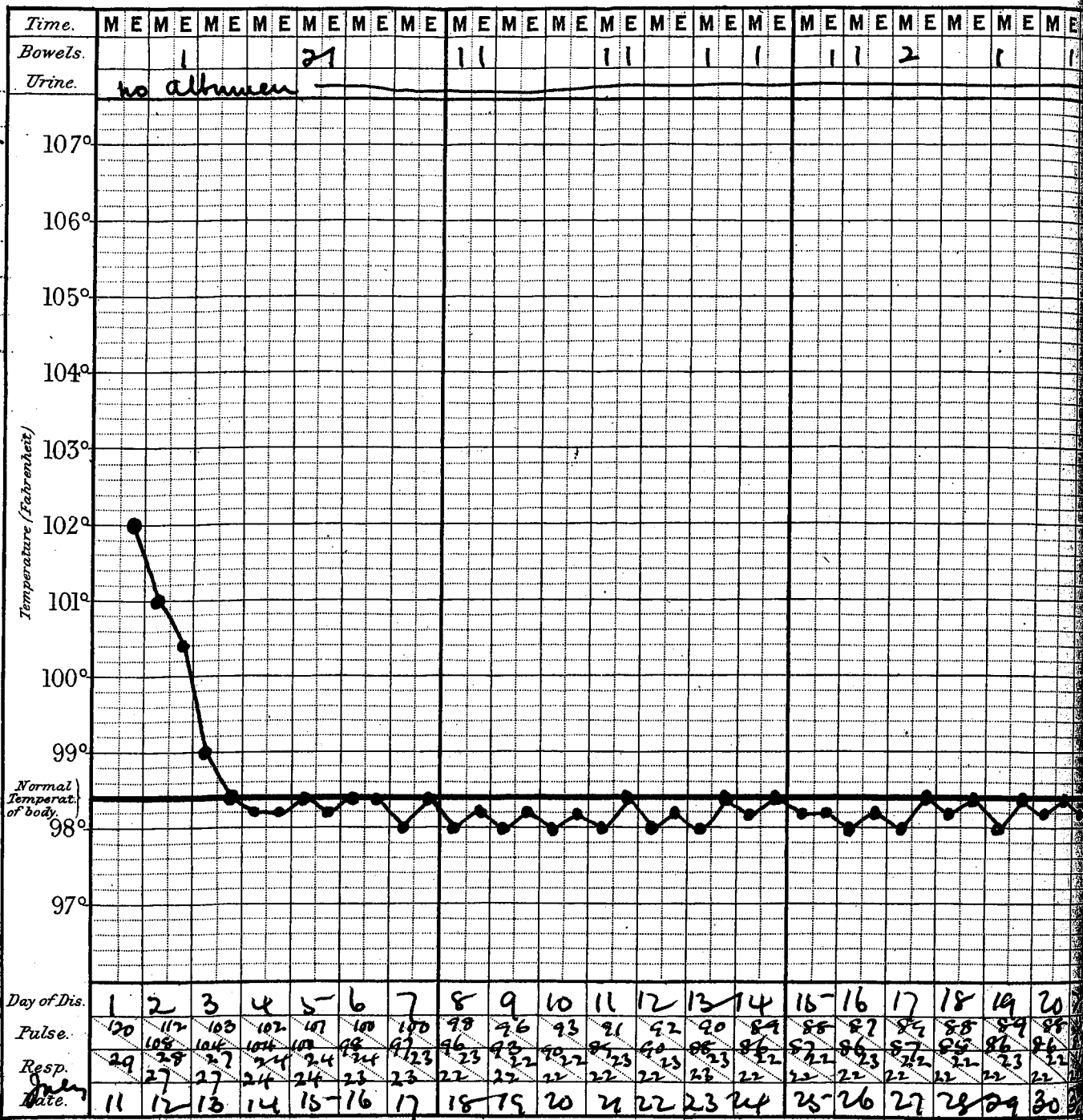
Diet

Case Book No.

No. 9(a).

Date of admission.
July 11th, 1905.

Result Discharged
Sept. 9th 1905.



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tongue never gave any aid to diagnosis, so that at the end of a fortnight she was allowed to get up, as there was no sign of any desquamation. However, towards the end of the third week, typical scarlatinal desquamation was seen commencing on the finger tips, and subsequently extended all over the hands. The feet also were involved, and showed the typical process, and were not clear until January 6th, 1905.

II. SCARLATINA SINE ANGINA.

In this form of the disease the throat symptoms are practically absent, although there may be slight injection of the fauces. As a rule, the rash is only slightly developed. The tonsils are not affected, and if there be faucial injection, it is not sufficient to cause any discomfort to the patient, so as to make him call attention to the throat. According to some observers, these cases usually present an important diagnostic sign - viz., a slight enlargement of the papillae of the tongue, most marked at the edges and tip.

Case and Chart.

Case IX a. - (Sine exanthemata. Sine Angina). - Clifford Dodd, aged 9 years, was admitted to hospital on the evening of July 11th, 1905. The history was, - seeing that the ambulance had gone to fetch another case from the same house, the medical attendant thought it would be better for him to go as well, as he had complained of not feeling well when in school the same afternoon, and he had also been sick. As there was no rash, and nothing could be seen in the throat, he was sent to the isolation wards. His temperature was, at 9.30 p.m., 102°F., pulse 120, respirations 29. The temperature was normal on the evening of the third day, and no trace of a rash was ever seen. The tongue was never typical. He did not complain of any sore-throat, and the fauces were never injected. On July 22nd, i.e., on the twelfth day of the disease, typical pin-hole desquamation was noticed on the finger-tips, and subsequently on the hands and feet. He was allowed up on August 1st, and his convalescence was

favourable until the 14th, when he contracted chicken-pox. This was an ordinary attack, and he was discharged from the hospital on September 9th.

Chicken-pox was brought into the ward by a scarlatinal patient who developed an attack four days after admission.

III. SCARLATINA SINE FEBRE.

Whether scarlet fever occurs without any rise of temperature is a very difficult matter to determine, for cases are not sent into the hospital until a day or two after the initial symptoms have developed; and frequently in private practice, cases occurring under this classification, would be thought to be so trivial, that advice would not be sought until desquamation was noticed.

Many authorities say they have never seen a case of scarlet fever without a rise of temperature. Leichtenstern (Deut. med. Woch., 1882, S. 173) reports one; and whilst Henoch makes no mention of any, Fürbringer and Bohn declare they have seen none.

Thomas ("Klin. Studien ueber die Niervenerkr. bei Scharlach", Arch. der Heilk., II, Jahrgang, S. 147) does not report any but cases having continuous though short fever; and Wunderlich ("Das Verhältniss der Eigenwärme in Krankh"., Leipzig, Otto Wigand, 1870, 2, Aufl., S. 330) says:

"Whether among those abnormally mild cases there also occur those in which the temperature shows absolutely no or a minimum change, I cannot say from my own experience, because I have never been able in very light cases to observe the beginning of the disease".

The temperature in these cases, after the slight initial rise, does not reach above 99°F., and all the other symptoms of the disease are present in a very mild form. Many such cases have been recorded by

DISEASE.

Scarlatina
Swi Febr

Notes of Case.

Name Elsie Wright.

Age 5 years.

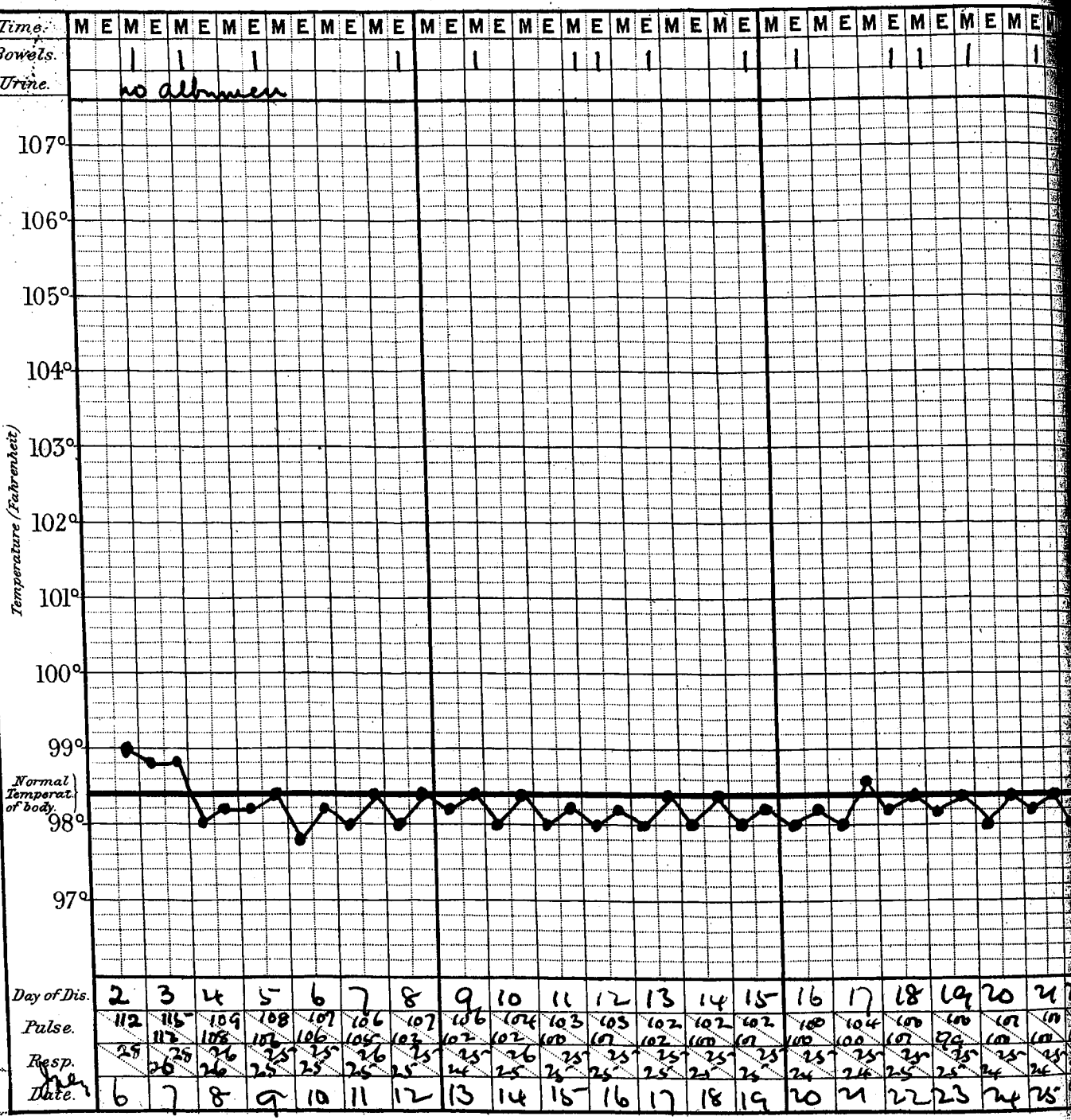
Diet

Case Book No.

ho. 11.

Date of admission.
July 6th - 1905

Result Discharged
Sept. 5th - 1905



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different authorities; and McCollom published a series of 37 cases, in none of which the temperature exceeded 99°F.

I have seen two cases, which I consider to belong to this form of the disease.

DISEASE.

Scarlatina
Sine Febre.

Notes of Case.

Name Henrietta Roberts

Age 14 yrs. Thornhill.

Diet

Case Book No.

No. 10.

Date of admission.
May 26th 1905

Result Discharged
July 18th 1905

Time.	M E	M E	M E	M E	M E	M E	M E	M E	M E	M E	M E	M E	M E	M E	M E	M E	M E	M E	M E	M E	M E	M E	M E	M E
Bowels.		1 2	1	1	1	2		1	1		1		1 1		1 1	2		1	1	1	1	1		
Urine.	No albumen																							
Day of Dis.	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21				
Pulse.	118 / 110	114 / 110	110 / 108	111 / 110	112 / 109	110 / 110	110 / 108	110 / 111	110 / 110	109 / 109	113 / 110	110 / 111	110 / 112	110 / 110	112 / 111	115 / 110	111 / 111	112 / 111	112 / 112	112 / 111				
Resp.	32 / 31	31 / 31	31 / 30	32 / 31	31 / 31	32 / 32	32 / 31	32 / 32	32 / 32	32 / 31	32 / 31	32 / 32	32 / 32	33 / 31	31 / 31	32 / 30	31 / 31	31 / 30	31 / 31	32 / 31				
Date. May	26	27	28	29	30	31	1	2	3	4	5	6	7	8	9	10	11	12	13	14				

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different authorities; and McCollom published a series of 37 cases, in none of which the temperature exceeded 99°F.

I have seen two cases, which I consider to belong to this form of the disease.

Cases and Charts.

Case 10.- Henrietta Roberts, aged 19 months, was seen by my partner's assistant on the evening of May 25th, 1905. The temperature was 102.2°F., pulse 118, respirations 32; and the child was fretful. Slight sore-throat, no vomiting, bowels constipated. Next morning a slight rash was noticed, and the child was sent into the hospital the same evening, when the temperature was 99°F., pulse 118, respirations 32. Next day the rash was only just perceptible, and the temperature that evening, and on the two following evenings, was 98.8°F., though subnormal in the morning. Desquamation was noticed on the neck on June 2nd. The subsequent course of the case was uneventful; the diagnosis was correct, as she also desquamated on the hands and feet. She was discharged on July 18th, 1905.

Case 11. - Elsie Wright, aged 5 years, has one brother and sister in the hospital with scarlet fever. The history was that, on the previous day she began to vomit, and the rash appeared on the chest the day she was admitted to the hospital - July 6th, 1905. I saw her on July 7th, the rash was fading, no sore-throat, temperature 98.8°F. Desquamation noticed on the face on July 10th, and well marked on the body on the 14th. She was allowed up on July 27th, and discharged on September 5th.

Henoch has recorded four cases out of 175 with a normal morning temperature, and a high evening rise; and he also described a case showing the inverse type of fever - i.e., a low evening with a high morning temperature. He considers this form to be a great rarity, but cases have been noted by Fürbringer and von Jürgensen.

CO-EXISTENCE OF SCARLET FEVER WITH OTHER DISEASES.

Many authorities have denied that scarlet fever ever co-exists with other acute exanthemata in the same individual; and, when Murchison, in 1859, reported a series of cases in which two or more infectious diseases were running concurrently, he also drew attention to the fact that other writers were opposed to this view. Since that time, several authentic cases have been recorded, although it must be admitted such occurrences are rare. There is no doubt that the presence of one disease in the body increases the susceptibility to the development of another infection; and the more severe the primary disease, the more severe will be the liability to the contraction of the secondary. In those cases which have been recorded where two exanthemata ran their course at the same time in the same individual, it is usual for the second infection to take place during the period of convalescence - i.e., after the rash of the primary disease has disappeared, and, in these cases, the secondary exanthem will show its usual characteristics.

When two infectious diseases co-exist, both the general and local symptoms will be liable to great variations, and the eruption is not always typical in its appearance and distribution, and when the rashes of two exanthemata are running their course at the same time, confusion in diagnosis is apt to result; though Murchison states that usually one is mild and more or less ill-defined. According to Fleischmann (p. 241), when two exanthemata develop the eruptive stage at the same time, the second disease moderates the first, and the length of its own course is also shortened, - but this view is not generally accepted.

The most common infection complicating scarlet fever is diphtheria, which usually occurs during the stage of desquamation, and is liable to be seen in mild as well as in severe cases. It seems to cling to certain wards and

hospitals. Although it is liable to develop at the beginning of an attack of scarlet fever, many of the cases diagnosed as such, have really been severe cases of scarlet fever with a non-diphtheritic exudation on the tonsils.

(Diphtheria will be fully discussed under the complications.)

Scarlet fever may also complicate diphtheria.

Measles comes next in frequency; and, according to Hukiewcz (Jahr. f. Kinderh., 1904, lix), who reported 21 cases, the greatest difficulty in diagnosis occurs when the measles precedes the scarlatinal eruption. When the scarlet fever eruption is first, the measles rash is typical, and the diagnosis easy, but when scarlet fever follows measles, the eruption is usually seen first on the legs and chest, where it appears as large, smooth, elevated, bright-red, almost shining patches, about the size of the palm of the hand, frequently resembling large urticarial lesions, and involving those parts of the skin where the measles rash is not fully developed. This rash fades in a few hours, the swelling becomes less, and then the typical smooth scarlatinal rash appears, which in its turn dies away, and leaves the pale brown mottling of the measles rash beneath. He believes that measles increases the susceptibility to scarlet fever, and reports two cases, of children, six months of age, in whom scarlet fever followed measles. (It is very rare for scarlet fever to occur in children under one year of age). He considers that the second week of incubation, and the prodromal stage of measles, is the period in which the susceptibility to scarlet fever is the greatest, whilst it is least so during the first week of incubation, and after the full development of the eruption.

In post-scarlatinal measles, the rash usually appears somewhat earlier than in the independent form of the disease.

Small-pox, chicken-pox, typhus fever, typhoid fever, and whooping cough have all been known to co-exist with scarlet fever, but such occurrences are rare. I have

DISEASE.

Scarlet Fever.

Chickenpox.

Notes of Case.

Name Amy Wilburn.

Age 6 years.

Diet

Case Book No.

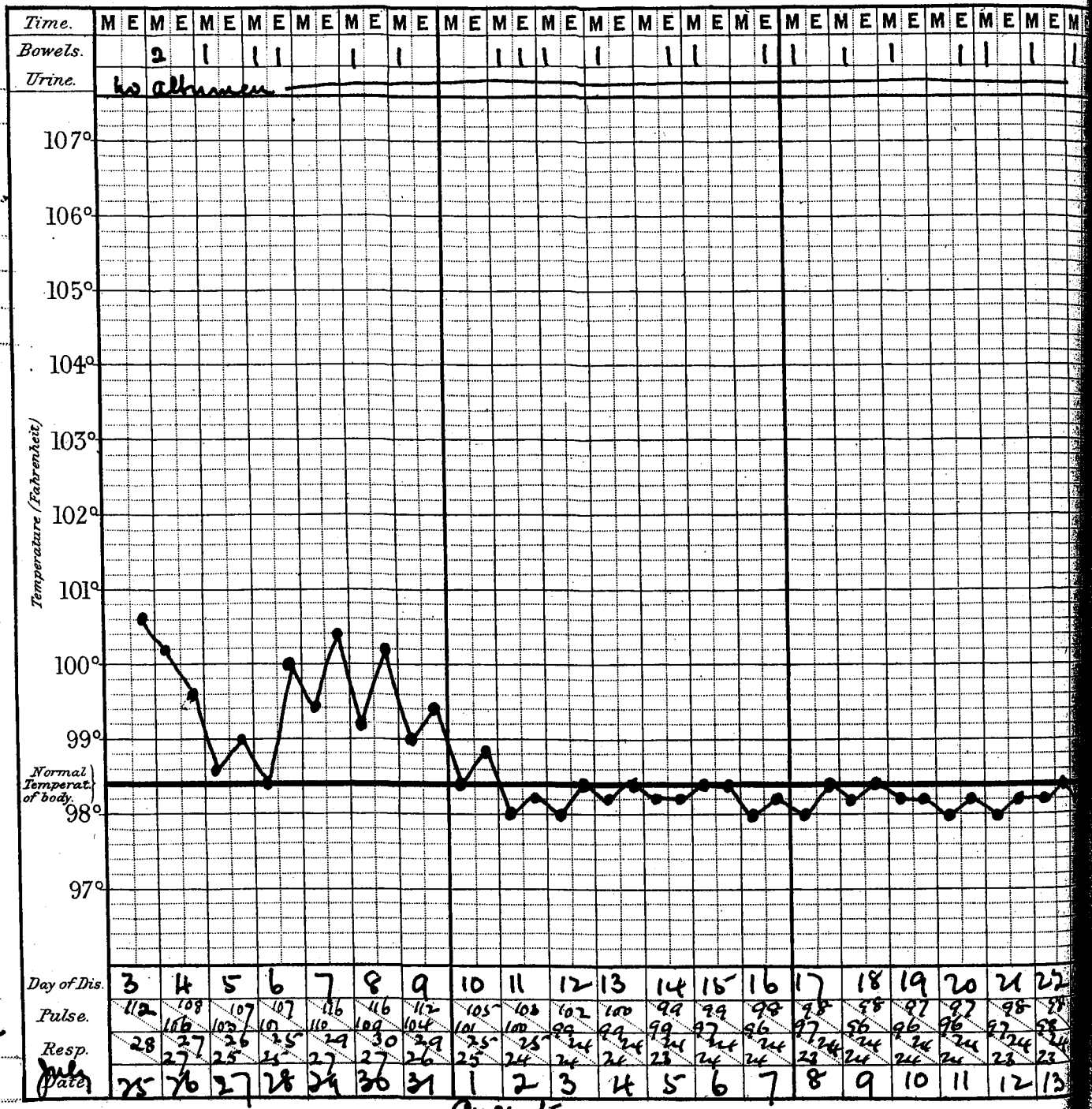
No. 12.

Date of admission.

July 25th - 1905

Result Discharged

Septr. 23rd - 1905



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seen one case where a patient developed a typical attack of mumps during the desquamative stage. It began on the left side, and spread to the right, and ran its usual course.

In small-pox the frequency of the prodromal scarlatinal rash must not be forgotten.

When chicken-pox and scarlet fever co-exist the attack is usually more severe, the eruption more copious, with a greater tendency to become pustular.

Case XII. - Amy Wilburn, aged 6 years, admitted to hospital on July 25th, 1905. Vomiting, sore-throat, and feverishness on July 23rd, rash on July 24th. On admission presented the phenomena of an ordinary case of scarlet fever, with the throat injected, but no patches. On July 28th, rash was fading, and there was an evening temperature of 100°F. Next morning a typical vesicular rash. Fresh crops kept appearing for four days. The rash was most copious on the legs. Four good vaccine marks. Desquamation noticed on the neck on August 1st, but the scabs of chicken-pox were not all shed until August 10th. Convalescence normal. Discharged on September 23rd.

L. Hetkoen (Med. news, Sept. 26, 1903) reports one, and quotes two cases of combined scarlet fever and typhoid fever, in which an early and sure diagnosis was made from an examination of the blood.

When scarlet fever complicates whooping cough, the whoop, as a rule, disappears during the febrile stage, but reappears when the temperature becomes normal.

Caiger reports that in one case he has seen scarlet fever, measles, diphtheria, and whooping cough all co-existent, whilst in another he observed scarlet fever, chicken-pox, measles, and whooping cough.

During the stage of eruption of scarlet fever, many other cutaneous rashes may be seen - e.g., urticaria, erythema, herpes, pemphigus, etc., whilst in septic scarlet fever, septicaemic rashes frequently occur. In

the haemorrhagic form of the disease, we notice a true purpura.

When scarlet fever occurs in a patient suffering from psoriasis or eczema, the diagnosis is frequently a matter of great difficulty, as the eruption is apt to be misleading. In some cases these diseases subside during the time the eruption is present, and increase in activity during convalescence; whilst, in others, during the eruptive stage we notice on different parts of the body raised, irregular patches of inflamed skin, which bear a strong resemblance to measles. On examination, these patches are found to be harsh and scaly, instead of soft and velvety. In these cases desquamation occurs early, and is usually excessive.

When scarlet fever occurs in a patient the subject of conjunctivitis, the face may look very much like measles, especially if the rash be of the morbilliform type.

It is said that scabies is not so active during an attack of scarlet fever, although the vitality of the acarus is not impaired.

COMPLICATIONS AND SEQUELAE.

The complications of scarlet fever form an important subject for study; for, if not ending fatally, they frequently cause a longer or shorter period of ill-health, and lead, in many cases, to permanent damage to the different organs of the body. They are apt to occur at any stage of the illness, and their appearance may be either gradual or sudden.

THE ANGINA.

In every case of scarlet fever, - with the exception of that form described as scarlatina sine angina, -lesions referable to the throat are amongst the earliest and most typical symptoms. In the mildest forms of the disease, these symptoms never assume severe proportions; but, in the septic type, they are frequently well-marked, and often constitute some of the gravest complications, - in many cases leading to wide-spread destruction of the tissues, and followed by a fatal termination.

Up to a short time ago, great confusion existed as to the exact etiological conditions to be found in those forms which are characterised by the formation of membrane; but, since the Klebs-Loeffler bacillus has been isolated, their recognition is an easy matter.

Whilst the specific cause of scarlet fever remains undiscovered, it will be impossible for us to say, with any degree of certainty, how much of these processes is due to the direct action of the scarlatinal poison itself, and how much to the different micro-organisms and their products which are found in the lesions in the throat.

Most observers agree with v. Jürgensen (p. 130) that at first these processes are the result of the scarlatinal toxine, and his statements have been corroborated by Fürbringer, Heubner ("Berner zur Frage der Scharlach diphtheritis", Jahr. f. Kinderh., N.F., Bd. 31, S. 56), and Henoch ("Vorlesungen", u.s.w., S. 643). The latter

lays special stress upon the causation of the necrotic inflammation by the scarlatinal toxine. When the lesions have advanced and become more complex, other micro-organisms are found - i.e., when the scarlatinal poison has opened the door, so to speak, septic organisms - e.g., the streptococcus pyogenes, make their appearance and develop.

Monti ("Studien ueber das Verhalten der Schleimbäute bei den acuten Exanthemen", Jahr. f. Kinderh., N. F., Bd. 6, S. 227) draws a distinction between the "angina scarlatinosa simplex", which he terms " the pharyngeal involvement in an uncomplicated scarlatina", and "cases running an anomalous course"; but there can be no hard and fast rule laid down, as frequently one form merges into another, and perhaps, in the same patient, one side of the throat may show one lesion, whilst, on the other side, we observe another. The most convenient form is to divide the conditions occurring in the throat into three varieties - viz.:

1. Erythematous.
2. Pseudo-membranous.
3. Gangrenous.

1. The Erythematous Variety. - This is simply an aggravated form of the enanthem, and can hardly be looked upon as forming a complication, unless it persists for a longer period than usual, and causes, at the same time, a prolongation of the febrile stage with an exacerbation of the local inflammatory process. It is simply the ordinary throat of simple scarlet fever rather more developed than usual.

2. The Pseudo-membranous Variety. - This form is seen in those cases where the pharynx is markedly involved - i.e., in the septic type of the disease, and is characterised by the formation of a false membrane upon the tonsils, which may also extend to the neighbouring parts. It usually begins about the second day of the illness; and, according to Henoch, the typical necrotic inflammation begins, as a rule, on the third or fourth

day of the disease, or even in the first twenty-four hours. On examination, we find one or both tonsils to be swollen and inflamed, and covered with gray or grayish-white patches of exudation, which are at first limited to the position of the tonsillar crypts. As a rule, both tonsils are affected (it is rare for the disease to be limited to one), but at the same time the affection may be more developed in the one than in the other. The mucous membrane of the pharynx is swollen and injected, and the glands under the jaw are enlarged, swollen, palpable, and tender to the touch. The temperature is raised, and the pulse is quickened. In some cases these patches remain separate, but in others they coalesce, and then the tonsils look as if they had been covered with a thin opaque varnish. The membrane can be brushed off, and when it is, it leaves a raw bleeding surface. Frequently the patches may be found to have extended to the soft palate.

In those cases where the issue is favourable, these conditions will last for a period of three to eight days, when the membrane is shed, with only a slight destruction of tissue. There is an improvement in the local and general condition of the patient, and convalescence is soon established.

In the more severe forms, the swelling and congestion of the pharynx is more intense, the tonsils are much more swollen, and the patches run together very quickly, forming a thick yellow membrane, which spreads to the uvula, the soft palate, both on its anterior and posterior aspects, and to the posterior pharyngeal wall. In the worst cases, this membrane may be seen upon the hard palate, the tongue, the gums, and the mucous membrane of the cheeks and lips; and it may even extend into the nares and Eustachian tubes, leading to disease of the middle ear. When in this condition, the patient presents all the symptoms of a most virulent septicaemia. The temperature is high, the pulse quickened and weak, the urine usually contains albumen, and the constitutional depression is severe and alarming. The breath is

horribly foetid, the salivary and buccal secretions not only of a disagreeable odour, but frequently mixed with blood; and when the process has involved the posterior nares, the nose becomes blocked, breathing becomes difficult, and a discharge appears at the nostrils. This discharge is of a foetid odour, intensely acrid, and is usually thin, sero-purulent, and tinged with blood, causing great irritation around the nostrils and on the lips (eczema). The neighbouring lymphatic glands, especially the submaxillary, are much enlarged, easily palpable, and very tender when touched.

As the disease develops, the membrane, which may now be almost black in colour, begins to break down, and the parts necrose, ulcerate, and slough. Swallowing is very difficult, and may be impossible, so that fluids regurgitate through the nose if that part be not occluded, whilst the broken-down tissue and the purulent discharge resulting from the process, may get into the larynx and cause constant and distressing cough. When the nose is blocked, the patient will have to breathe with open mouth. The swelling of the lymphatic glands may increase, and the cellular tissue of the neck become infiltrated, hard, and indurated. Septic manifestations occur in other parts of the body, the patient looses ground, and finally becomes comatose and succumbs.

Before the discovery of the Klebs-Loeffler bacillus, many, if not all, of these cases characterised by the formation of membrane were looked upon as being true diphtheria; but, since that time, many authorities have made extensive researches, and proved conclusively that the diphtheria bacillus is absent, in most cases, at any rate, and that the process is the result of the streptococcic infection. The streptococcus pyogenes is almost constantly to be found, the staphylococcus pyogenes aureus occasionally, and in a few cases other pathogenic micro-organisms may be present.

Chabade ("De l'Association de la Scarlatine avec la diphthérite", La Semaine Medicale, 1899, p. 184),

with a view to determining the nature of the pseudo-membranous angina occurring in scarlet fever, examined the throats of 214 scarlatinal patients in the hospital at St. Petersburg. His results were:

98 had a catarrhal angina. In these he found streptococci, staphylococci, but never the Klebs-Loeffler bacillus.

33 had a lacunar angina - i.e., a pseudo-membrane covering only the tonsillar crypts. In 2 of these he found the Klebs-Loeffler bacillus, and in 1 it was present in almost pure culture.

83 had a true pseudo-membranous angina, and in these the membrane extended over the tonsils, and upon the pillars of the fauces and the neighbouring parts. In 11 cases he found the Klebs-Loeffler bacillus, and in 3 of these it was in almost pure culture, and in 8 it was associated with streptococci.

Variot and Devé (Soc. méd. d. Hôp., 1900, xvii, p.1025) published a series of 525 cases of scarlet fever. Their results were as follows:

In 31 cases the diagnosis of the type was doubtful, as the patients were only seen during the stage of desquamation.

432 showed the ordinary symptoms of scarlatina simplex.

62 showed an exudative angina.

There were 212 cases of angina, of which 150 were non-exudative, and 62 were exudative.

Of the 62 showing exudative angina -

32 were "diphtheroid", of these 8 died, - a mortality of 25 per cent.

30 were true diphtheria, and of these 6 died, - a mortality of 20 per cent.

The death rate amongst the 432 cases of scarlatina simplex was about 3 per cent.

Garratt and Washbourn (Ann. de méd. et chir. infantiles, 1899, t. III) analysed 666 cases of scarlet fever treated at the London Fever Hospital during the years 1896-1898, and of these, over 1 per cent. showed the Klebs-Loeffler bacillus in the throat when admitted.

Clinical evidence of diphtheria was noticed only in a very small number of these cases.

Lemoine ("Role du Streptococque dans la Scarlatine et ses Complications", Bull. et Mém. de la Soc. des Hôp. de Paris, 1895; Ibid., 1896, III, S.XIII, 303-319; Vide Soc. Proceed. Gaz. des Hôp., Dec 24, 1895, p. 1449) studied 107 cases of scarlatinal angina bacteriologically, and in 93 found the streptococcus pyogenes alone; in 5 he found the Klebs-Loeffler bacillus and the streptococcus pyogenes; and in 9 the bacillus coli communis.

3. The Gangrenous Variety. - This form which is extremely rare, only occurs in the most severe type of the disease. It is almost unknown in private practice, and is seen oftener in hospitals; but, even there, it seldom occurs, owing to the better nursing, and the greater attention bestowed upon the throat. It is almost invariably fatal, and shows no tendency to repair. The pharyngeal lesions quickly assume a gangrenous form. Patches appear on the tonsils, uvula, soft palate, pharynx, and perhaps the tongue. These patches are of a grayish-black colour, and are lower than the surrounding mucous membrane, which is much swollen, as is also the part involved in the process. These patches extend and meet very rapidly, causing wide-spread destruction of the tissues, which frequently extends to the cellular tissue of the neck. The gangrenous parts may come away, leaving large ulcers, often covered with sloughs, which bleed easily. We may observe perforation or loss of the soft palate, sloughing of part or of the whole of the tonsils, and the ulceration may extend and involve large blood-vessels, causing fatal haemorrhage.

The constitutional symptoms are very severe, and the depression is intense. The breath has a horrible odour, there is a foetid secretion from the mouth and nose, the lymphatic glands at the angle of the jaw and those in the neck are very much enlarged. The pulse is very weak and small, and in some cases it may be slow, whilst the temperature may be high or even subnormal, with cold

extremities.

RHINITIS.

Rhinitis may also occur in cases when the throat affection is slight.

EARLY PURULENT CORYZA IN SCARLATINA.

In the "Rev. d. mal. de l'enfance" of February, 1901, there appeared a report of the physicians at the isolation hospital at Porte d'Aubervilliers, on this symptom; and, according to them, was looked upon as more dangerous than the worst forms of angina. It was especially noticed during the stage of eruption, and as it was highly infectious, the nasal sinuses, the middle ear, and the cervical glands were apt to be involved. The latter usually suppurated. Streptococci were found in great numbers in the discharge, and the patient usually presented symptoms of a grave septicaemia. It was considered to be the most fatal of all the complications, as the mortality was over 50 per cent.

TRUE DIPHTHERIA.

This is the gravest complication which may occur during an attack of scarlet fever; and whilst it may appear at any time of the disease, it is most common during the period of convalescence - i.e., after the primary pharyngeal lesions have all disappeared. It may follow the mildest attack, as well as the most severe; and, according to Caiger, its onset appears to be most common during the fourth week of the disease. When it occurs at the beginning of the scarlatinal attack, it is liable to be mistaken for the septic form of the disease, and, on the other hand, it may be so mild that there is nothing to suggest its presence (unless one is suspicious and resorts to a bacteriological examination) until paralysis or cardiac weakness appears.

According to Caiger, in 14,548 cases admitted to the hospitals of the Metropolitan Asylums Board in 1893, 1.4 per cent. had a scarlatinal diphtheria; and it

appeared to be most common in children under five years of age. It is far more prevalent in hospitals than in cases treated in private practice (especially among the upper classes); and, whilst appearing to be inseparable from hospital life, it clings to certain hospitals and certain wards.

Anatomically, it may be impossible to distinguish the throat lesion in diphtheria from that produced by the streptococcus pyogenes, and the symptoms are essentially those of the true disease. It is followed by paralyses; whereas, in the pseudo-membranous form of scarlet fever, they never or only rarely occur, - but its most striking feature is its high rate of mortality. According to Caiger, no less than 58.3 per cent. of those who develop the disease die, - a mortality nearly twice as high as the independent form of the disease; but one point must not be overlooked, and it is this, - it seems to have a greater tendency to affect the larynx, and the results of tracheotomy are not so good as when performed in the independent form.

Causes.- The experience of this complication has only been gained in hospitals, where it not only seems to cling to certain wards, but occurs with varying frequency at different times in the same hospital, and appears to be dependent upon some condition peculiar to hospital life.

An important factor is the introduction of an unrecognised case of diphtheria into a scarlatinal ward; but Caiger says that "a recognised case of diphtheria rarely, if ever, gives rise to other cases in a scarlet fever ward, if that ward be properly ventilated and provided with sufficient floor-space per bed". Its development is favoured by defective drainage, and by overcrowding, even if only temporary, and it may be carried by books, toys, linen, or by nurses, or by those attending on the sick; whilst, according to different authorities, the proximity of a diphtheria ward does not seem to have any influence upon its occurrence.

Caiger thinks its occurrence is due to some atmospheric or soil conditions. He states (Allbutt's Syst. of Med., Vol.2, p.160) that "a few cases (perhaps two or three or more) may occur simultaneously or in close succession in the different wards of a large hospital, which are not only widely separated, but which have no administrative factor in common, except the food supply which can be eliminated."

Such outbreaks appear to occur more frequently in wards surrounded with grass or other vegetation growing on a clay soil; and Caiger thinks the subsoil drainage (whether natural or artificial) is of far less importance than the moisture-retaining character of the actual surface. He noticed that such outbreaks have frequently occurred in seasons "characterised by a high degree of atmospheric humidity, dependent upon previous rainfall and consequent dampness of soil".

SECONDARY TONSILLITIS.

This sometimes occurs during convalescence, according to Caiger, in about 1.64 per cent. of cases. It may appear as a simple or follicular tonsillitis; as a rule, it is not severe, and only in a few cases goes on to suppuration. It is liable to occur at any part of the period of convalescence, and is more frequent in adults and older children than in the young, and in females than in males (three times more in the former). It has also been noticed that those patients who are subject to it, or whose tonsils are chronically enlarged, are much more liable than others. Its occurrence seems to be affected by damp weather, and also by the severity of the scarlatinal attack, and it is also more liable to occur when the wards are overcrowded with acute cases.

Affections of the throat in scarlet fever are apt to be followed by chronic enlargement of the tonsils.

Case and Chart.

Case 14. - Ernest Wright, aged 3 years, admitted to hospital on July 5th, 1905. Initial symptoms, -

DISEASE.

Scarlet-fever
Pseudo-membranous angina

Notes of Case.

Name Ernest Wright

Age 3 years.

Diet

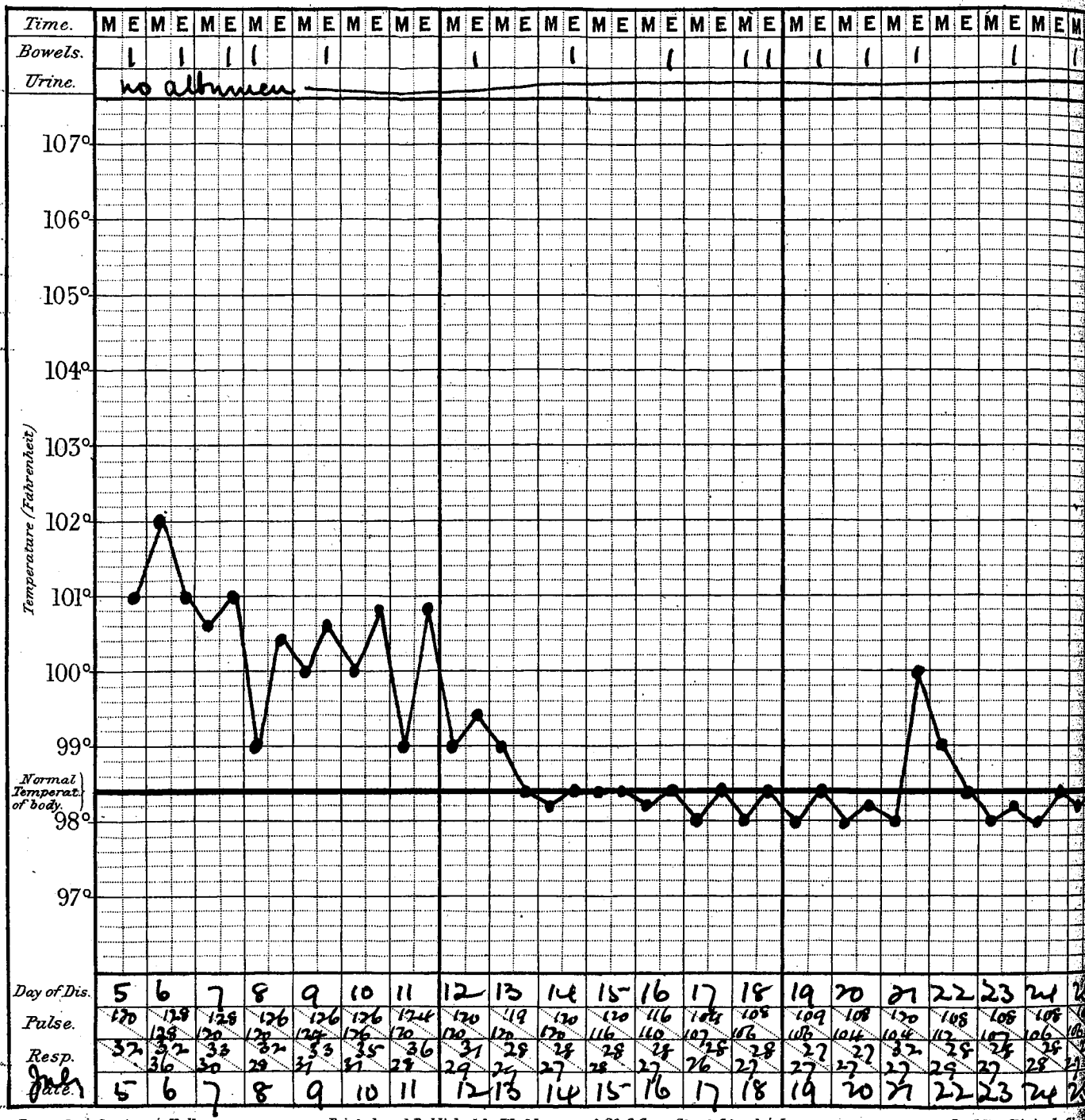
Case Book N.º

No. 14.

Date of admission.

July 5th 1905

Result Discharged Sept. 5th 1905



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vomiting, sore-throat, and feverishness on July 1st, the rash appearing next day. On admission, the temperature was 101°F., pulse 120, and respirations 32. The tonsils were enlarged and covered with a dirty yellowish membrane, some of which had extended on to the uvula. The tongue was covered with a dirty yellow fur, and was atypical; the bowels were constipated, and the urine deposited lithates. No albumen. The glands under the jaw were enlarged and tender on palpation. No Klebs-Loeffler bacilli were found; streptococci present in large numbers. Next day (July 6th) the morning temperature was 102°F., pulse 128, and respirations 36. During the following week the temperature varied, and did not reach the normal until July 14th, on which day the throat appeared to be normal. He seemed to be progressing favourably until the evening of July 21st, when the temperature reached 100°F. Next morning a discharge from the left ear was noticed, and the temperature at night was again normal. The discharge continued until August 8th, and desquamation was finished on September 1st. He was discharged from the hospital on September 5th.

THE EAR.

Inflammation of the middle ear is not only one of the most common complications of scarlet fever, but it is also one of the most serious. It may occur in mild as well in severe cases; but, as a rule, it is much more frequent in the latter. According to Holt ("Diseases of Infancy and Childhood", New York, 1897, p. 101), it occurs in 75 per cent. of the severe cases. It may develop at any stage of the disease after the first few days, and usually it appears before the beginning of desquamation - i.e., about the end of the first week, though it may not first appear until as late as the third week of the illness. In severe cases it usually appears earlier than in mild, and some say (e.g., Dukes) that when it occurs in mild cases there is usually a predisposition to otitis, even amongst those in affluent circumstances

It is most common during the first five years of life, the liability to it then diminishing each year, until after the fifteenth year, when it is extremely rare;

but, even in adults, there is a great tendency for the scarlatinal attack to lighten up old-standing ear mischief. It does not appear to affect girls more than boys.

In some cases we notice the otorrhoea is due to a simple inflammation of the external auditory canal, which may be the result of the local extension of the inflammation of the skin extending upward on the side of the head. The inflammatory process may involve the tympanic membrane to a greater or less extent, and there may be in some cases even local abscess formation. As a rule, this form is mild, disappears very rapidly, and is of no great importance compared with the next form.

The inflammation of the middle ear - otitis media- is usually due, especially in those cases which occur before the throat lesions have subsided, to an extension from the fauces along the Eustachian tube. The mucous membrane of the tube becomes swollen, and its calibre narrowed. There is a more or less abundant muco-purulent discharge pent up in the middle ear as a result of this process, which soon relieves itself by perforation of the tympanum if not let out by incision. Otitis media is much more common in some epidemics than in others; and, as a rule, both ears are affected, though not simultaneously.

According to Caiger (Allbutt's Syst. of Med., Vol. II, p.150), out of 4015 cases of scarlet fever treated in the South Western Fever Hospital, Stockwell, during the years 1890-1892, the percentage of cases of otitis media with discharge was 11.05.

Baader and Guinon (See Moizard, "Scarlatine", in Traité des Mal. de l'enfance, Paris, 1897, Vol.1, p.143) state that the mild or catarrhal form of otitis media is very common and occurs in 33 per cent. of all cases of scarlet fever, whilst the purulent form is less common, and occurs in only 4.5 per cent.

Burckhardt-Merian ("Ueber den Scharlach in seinen Beziehungen zum gehörorgan", v.Volkmann's "Samml. klin. Vort.", Chirurgie, No. 54), among 85 cases of ear

complications after scarlet fever reported by him in 1880, found no less than 72 cases (84.7 per cent.) in which both ears were affected; and, according to him, out of 4309 cases of acquired deafness and dumbness reported by himself, no fewer than 445 (10.4 per cent.) were referable to scarlet fever.

Vivy reports an epidemic at Aumale (Algiers), in 1880. Of 11 cases of otorrhoea, 4 developed after the rash and angina had completely disappeared; 7 developed after the disappearance of the angina, eruption, and desquamation. According to him, the ear lesion is to be looked upon as one of the localisations of the scarlatinal poison.

Symptoms.- In many cases, especially in young children, we may have no suspicion of the development of the disease until the temperature rises, or the discharge appears from the external ear. This is especially so in those cases where it develops at the height of the scarlatinal attack, although even in such cases we may notice that the child is fretful, shows great irritability of temper, and may even rub the ear in an indefinite manner. In older children we may not detect any difficulty of hearing.

In a typical mild case we should expect the following symptoms; as a result of the extension of the disease from the throat along the Eustachian tube, causing it to be occluded, and so preventing the escape of any exudation formed in the middle ear, the attack is usually ushered in by severe pain in the affected organ, along with a rise of temperature (In some cases pain may be altogether absent). The cartilaginous portion of the canal is very tender to the touch, the glands below the ear are usually enlarged, palpable, and sensitive to pressure. In some cases the attack may be ushered in with symptoms referable to the brain - e.g., convulsions or coma. There is more or less irritability of temper, whilst at the same time we notice that the hearing is not so acute. In children we may have to shout, whilst older children and adults say that they hear everything as from

a distance, and frequently complain of tinnitus aurium. The glands below the ear usually remain enlarged for several days, and in some cases may suppurate. These symptoms last, in most cases, for three or four days, and if no relief be given by incision, the membrana tympani ruptures, after which we notice a rapid and marked improvement in the patient's condition. The pain ceases, the tenderness disappears, the temperature subsides to the normal, and on the appearance of the discharge, if the case be of the milder variety, the patient is on the high road to recovery. If appropriate treatment be used, the discharge ceases in from two to four weeks, and the perforation in the membrana tympani rapidly heals, although in some cases recovery may not take place for three or four months or even longer.

According to Bürkner ("Handb. der spec. Therap. inn. Krankh.", Penzolat und Stitzing, Bd. 1, S. 586), in these mild cases we find the membrana tympani to be injected, lustreless, of a reddish-gray colour, and funnel-shaped. In those cases where there is a considerable amount of secretion, we notice the exudate to appear through the lower portions of the tympanic membrane of a yellowish colour, and where the secretion is very marked, there will be a bulging outwards, especially of the posterior upper quadrant of the tympanic membrane, or of the entire membrane itself.

Acute Otitis Media (Suppurative).

This form is usually seen in those cases where the faucial lesions are of a grave type, and is of a very serious nature, as it is usually followed by permanent total deafness, and chronic otorrhoea. The symptoms are the same as those described in the preceding simple form, but, as a rule, are considerably aggravated, the temperature in particular being higher, and frequently very irregular. In three or four days, if no incision be made into the tympanic membrane, perforation occurs, and there may be a great improvement in the symptoms, but in many cases the process has been so destructive, that in addition to the total or partial loss of one or both

tympanic membranes, and of one or of more of the auditory ossicles, we may also notice necrosis of the bone, extension of the disease to the mastoid cells, paralysis of the facial nerve, and various other cerebral lesions.

In these cases, according to Bürkner, "There is already in the first hours an active injection of the vessels, then a bluish-red, somewhat yellowish-red, colour of the membrana tympani. The edges of the somewhat flattened membrane are not always distinctly recognisable, because the neighbouring deep-lying portions of the auditory canal are also injected and swollen. The swelling of the tympanic membrane increases rapidly, the handle of the malleus disappears, a serous transudate occurs, and usually a desquamation also, which when it begins to roll off tiny shreds of epidermis, can impart a map-like appearance to the membrane. After the constantly increasing bulging, through which one may sometimes see the secretion distinctly shining, there follows after a few hours, or more frequently one to three days, the breaking through of the pus - the perforation. This is, at the start, very tiny, and its position in the majority of cases is the anterior lower quadrant. In the auditory canal pus occurs sometimes in small, and sometimes in very large quantities."

In some cases an inflammatory swelling occurs behind the external ear, and over the mastoid process. This swelling causes a more or less projection forwards of the external ear, and is accompanied by extreme local tenderness, and a rise of temperature. As a rule, it is due either to a periadenitis of one or more of the posterior auricular glands, frequently ending in suppuration, or to a periostitis leading to the formation of a subperiosteal abscess. In the latter cases, which are the more common of the two, the abscess will be found to be associated with carious bone, and pus in the mastoid cells, but sometimes the parts are perfectly healthy, and then the pus must have burrowed from the middle ear between the bony part of the auditory canal, and the cartilage of the ear.

Frequently, along with these changes, we notice more or less of oedema of the eyelids of the same side, due to the inflammatory process being prevented from spreading upwards by the firm attachment of the temporal fascia to the temporal ridge, and downwards by its attachment to the zygomatic arch. Consequently it can only extend forwards towards the eye.

Sometimes we notice a superficial swelling, either anterior to or below the external auditory meatus. This is due to an enlarged and perhaps suppurating auricular gland.

Suppuration of the Mastoid Cells.

(Empyema of the Mastoid Antrum).- This is a rare occurrence after chronic suppuration of the middle ear, but is attended by very urgent symptoms, and unless relieved by operation death frequently results. The symptoms following a communication between the tympanic cavity and the mastoid cells are: The patient frequently has a rigor, the temperature rises quickly to 104° or 105°F., or even more, and may show marked fluctuations. There is a diminution in the amount, or even a cessation, of the discharge from the ear, the pain is increased and very often of an agonising character, whilst there is extreme tenderness over the mastoid process. The skin over that part of the bone becomes swollen and red, the pulse is rapid, and frequently irregular and intermittent, and the patient is irritable and very restless, whilst vomiting is a very common symptom. The discharge may now become more profuse, and the symptoms being relieved, the patient feels much better but in a few days another rigor occurs, with an exacerbation of all the symptoms, and if no operation be performed for his relief, he dies, after a longer or shorter time, from meningitis, or some other cerebral complication. According to Caiger, the temperature in these cases may reach 112°F. before death; and he also states that frequently pus is found in the mastoid antrum when not suspected during life.

Owing to the anatomical relations, an extension of the disease from the tympanic cavity to the dura mater is favoured, and in addition to meningitis, such complications as intra-cranial abscess, both subdural and in the substance of the tempero-sphenoidal lobe, or cerebellum, septic thrombosis of the lateral sinus, or pyaemia, are all liable to follow chronic middle ear disease, being more likely to occur in those cases which are treated at home, and in which proper attention has not been paid to the ear.

Cases have been recorded where middle ear disease has been followed by ulceration into large vessels, causing fatal haemorrhage. Baader ("Acute Verblutung bei Scharlach", Corresp. f. Schweiz. Aerzte, 1875, Bd. 5, S. 617) records a case which was under the care of Dr Kunz. The patient, a boy of three years of age, had a purulent otitis media, and on the twelfth day of the disease, haemorrhage took place from the ear, which became severe, and not being controlled, ended fatally on the fifteenth day of the illness. At the autopsy, a perforation of the posterior wall of the tympanic cavity, and an erosion of the transverse sinus, were found.

Hessler also reports a case of ulceration of the carotid, and, as a result, fatal haemorrhage.

Hynes reports a case of a child, four years of age, who had a fatal haemorrhage without any warning. When visited by the physician, the child was, to all appearances, perfectly well, and shortly afterwards he was seized with arterial haemorrhage from the right ear. This was apparently stopped, but very soon the child began to vomit large quantities of blood, and died very quickly. It was supposed that the internal carotid was torn, the blood passing into the stomach through the Eustachian tube.

Cases and Charts.

Case 15.- Mary Ann Souter, aged 2 years, admitted into hospital on May 1st, 1905. The initial symptoms, sickness and vomiting, were noticed on April 30th, and the

rash appeared the next day, when she was sent into hospital.

On admission the temperature was 102°F., pulse 136, respirations 36. The tonsils were enlarged, but there were no patches upon them. The glands under the jaw were only slightly enlarged. There was a thin purulent discharge from the nostrils, the tongue was the typical white strawberry, the rash was well marked on the trunk and extremities, the bowels were constipated, and the urine contained no albumen. She seemed to have an ordinary attack of scarlatina simplex, with the exception of the nasal discharge, and the temperature was normal on the morning of the next day. It rose to 98.8°F. in the evening, but was either normal or subnormal for the next eighteen days. The rash had disappeared on May 5th, and desquamation was first noticed on the neck on May 8th. On May 9th, discharge was noticed from both ears, which finally ceased on July 12th. No cause could be found for the rise of temperature, - On May 20th, 24th, and 29th. She was discharged from the hospital on July 18th, 1905.

Case 16.- Fred Bolton, aged 3 years, admitted into hospital on May 26th, 1905. The initial symptoms were noticed on May 23rd, and the rash appeared the next day.

On admission (May 26th), the rash was well developed on the trunk and extremities, the temperature was 102.6°F., the pulse 134, and the respirations 32. The tongue was not typical, being covered with a dirty yellow fur, the tonsils were enlarged, and covered with grayish patches which had run together, and there was a discharge from both ears. The glands under the jaw were enlarged and very tender to the touch. The bowels were constipated, and the urine was free from albumen. The temperature rose to 104°F. on the evening of admission, and although it fell to 99.2°F. on the morning of May 29th, it subsequently rose again, and showed great variations. The patient suffered from an attack of the septic type of the disease. He was allowed out of bed on July 1st, but the aural discharge did not cease until July 14th. He was discharged on July 21st, 1905.

THE LYMPHATIC SYSTEM.

In almost every case of scarlet fever we notice an enlargement of the lymphatic glands, which we are justified in ascribing to the action of the scarlatinal poison itself, this enlargement being less pronounced in the mild than in the severe forms of the disease. Caiger, in 4015 cases of scarlet fever found cervical adenitis to occur in 8.74 per cent.

Schamberg ("A Clinical Study of the Lymphatic Glands in One Hundred Cases of Scarlet Fever", Ann. of Gyn. and Ped., Vol. 13, Sept. 1900, pp. 191-196) examined the superficial glands in 100 cases of scarlet fever, and found them to be enlarged in the following proportions - viz.:

Inguinal glands	100 per cent.
(a) pea-sized.....	23 per cent.
(b) bean-sized ...	77 per cent.
Axillary glands	96 per cent.
Maxillary "	95 "
Posterior cervical	77 "
Anterior cervical	44 "
Submaxillary	36 "
Epitrochlear	26 "
Sublingual	25 "

According to this authority, marked enlargement of the lymphatic glands was found in all cases which were examined on the second or third day of the disease, and he also states that the maxillary glands not only attain the largest size, but are the most prone to undergo suppuration. The posterior cervical glands, though being enlarged in a great number of cases, never reach a very great size.

As a rule, the enlargement of the maxillary and submaxillary glands occurs at a very early period of the disease, and when the eruption disappears, and the temperature reaches the normal, they return to their original size. In many cases, however, usually in patients who have not attained the age of puberty, we

notice an enlargement to occur during the period of convalescence - i.e., during the second, third, or fourth week of the disease. It is rare for it to occur after that time, and is much more common in the severe than in the mild forms of the disease. It is frequently noticed in those who are the subject of nephritis, but in many instances no cause for its occurrence can be made out. We may notice it in a group of patients in different parts of the hospital; and, whilst Caiger states that it has no relation to the time of the year, or to cold, or damp, or to diet or habits, he thinks that some atmospheric or soil condition may play an important part in its causation.

Furthermore, it seems to occur equally in females as in males.

In the mild forms the symptoms are: We notice a rise of temperature (but not very high), the patient feels out of sorts, and the glands, on examination, are found to be enlarged, movable, and tender on pressure. In many cases we find a slight albuminuria. If the process is to end in resolution, the temperature will remain raised for a few days (five to ten), when the swelling will gradually become less, the painfulness will disappear, the temperature will return to normal, frequently very suddenly, and with a return of the appetite the patient feels very much better.

In some cases, usually about one-third, instead of resolving, the process goes on to suppuration. The temperature remains high, and is often of the septic type, being normal or nearly so in the morning, and much higher in the evening. There may be more or less profuse sweating, and pus ultimately forms, first in the centre of the gland. Many days or even weeks may elapse before it points, and before it does so, the patient runs the risk of secondary septic affections occurring in different parts of the body - e.g., in the joints. When the pus is efficiently evacuated, the patient, as a rule, makes a rapid and complete recovery.

In the more severe forms of scarlet fever, especially in those in which the septic processes in the pharynx are well marked, the maxillary and submaxillary glands may be much enlarged, very hard, and tender. In some instances the enlargement may be on one side only, but, as a rule, it affects both sides, and may be so great as to limit the movements of the head. Instead of resolving, the process goes on to suppuration, and unless the abscesses are freely incised at an early stage, serious complications may ensue. Even when an ample incision has been made into them, instead of discharging externally, they may burrow in different directions, not only causing severe constitutional disturbance, but even fatal haemorrhage from erosion of the blood-vessels. In other cases the inflammatory process from the glands spreads to the surrounding cellular tissue, causing a very severe complication, to which the name Angina Ludovici or "Tippet-Neck" has been given. In this form, which, though usually occurring during the second week of the disease, may be seen as early as the fifth day, the symptoms are those of a severe form of septicaemia. There is loss of appetite, the temperature is high, with considerable remissions, and the pulse is quick, irregular, and frequently intermittent. The patient suffers from severe rigors, followed by copious perspirations, the urine usually contains albumen, and the kidneys may show the changes characteristic of septic nephritis. Locally the swelling is intense, the skin is hard, tense, of a bluish-red colour, shining and glossy, and although it may pit on pressure, it does not give the sense of fluctuation. The swelling may be limited to the parts around the angles of the jaw, or it may involve the whole neck, even extending upwards to the face and downwards as far as the clavicles. In these cases the face is more or less swollen by oedema, the lips are also swollen, and their mucous membrane is dry, and often covered with blood-stained crusts. The nostrils are blocked with bloody crusts, and frequently excoriated; the tongue is dry, brown, and swollen, and the breath horribly foetid. The cellulitis may be so intense as to press upon the larynx, and impede respiration, whilst in some cases

oedema of the larynx may also occur. Small foci of pus form in the inflammatory mass, there is much burrowing under the skin, and death results, either from haemorrhage due to erosion of one or other of the large blood-vessels, or from thrombosis or embolism, with meningitis and pyaemia.

Baader ("Acute Verblut. bei Scharlach", Corresp. f. Schweizer Aerzte, 1875, Bd.5, S.614) reports two cases of acute haemorrhage in scarlet fever. One was a boy, four years of age, who had a suppurating gland in the neck. This was incised, as was also a secondary swelling which had formed and threatened life from suffocation. Coagula were removed from the latter, and then a severe arterial haemorrage occurred, which was arrested by compression. Three days afterwards, a fatal haemorrhage took place from the nose. At the post-mortem examination, erosion into the carotid was found.

The second case was a boy, six years of age, who had a cellulitis of the neck. This was opened above the clavicle, and a week after he developed double pneumonia. Profuse haemorrhage took place from the external jugular vein, and he died in twenty-four hours.

Evans reports three cases of fatal haemorrhage occurring in patients suffering from cellulitis of the neck; and Henoch also reports two cases in which fatal haemorrhage occurred after opening a suppurating gland.

Hamilton (Cited in Canstatt's "Jahresbericht", 1863, Bd.4, S.131) relates a case where the gangrenous process extended from the necrotic cervical glands and caused a perforation on the posterior wall of the jugular vein. The patient survived.

Henoch has recorded a case where pus was found at the apex of the right pleural sac, and he also ("Vorles. ueber Kinderkr., S.634) cites two cases in which there was rupture of the pharynx and fatal haemorrhage.

Barbels has also recorded the fact of having seen cases where the pus had burrowed into the pleural cavity.

DISEASE.

Scarlet Fever.

Adenitis.

Notes of Case.

Name Ethel Gallantree

Age 17 years.

Diet

Case Book No.

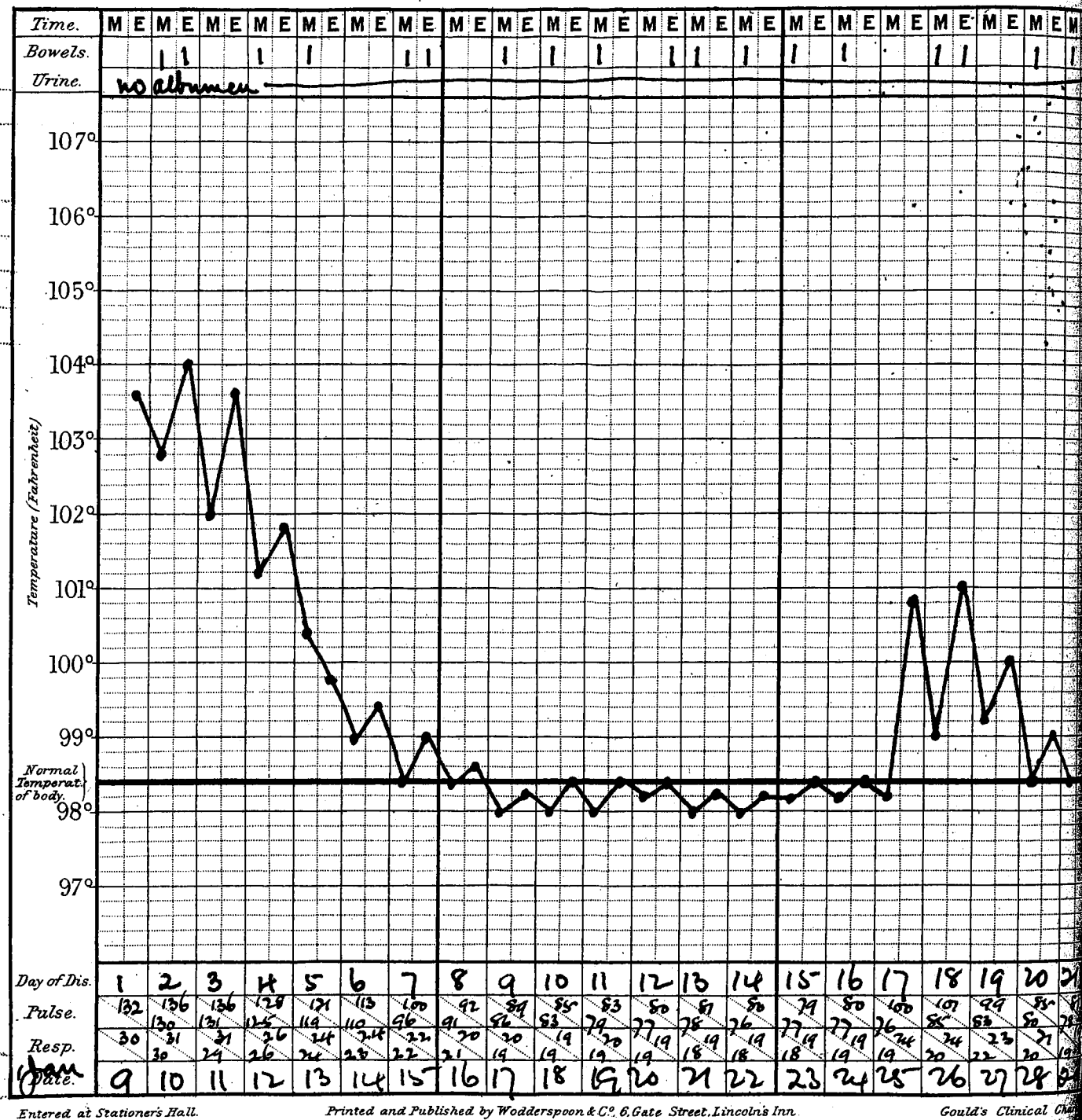
No. 17.

Date of admission.

January 9th 1905

Result Discharged

March 6th 1905



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Retropharyngeal Abscess.

This does not appear to be common in its occurrence as a complication of scarlet fever. Bokai (Jahr. f. Kinderheilk., N.F., Bd.10, S.108) has seen it in seven cases out of 664 cases of scarlet fever in the children's hospital. He thought it was due to a retropharyngeal lymphadenitis arising from the influence of the scarlatinal poison in six of the cases, whilst in the seventh, he thought it occurred through metastasis. He also reports a fatal case in which suppuration appeared in a retropharyngeal gland on the fifth day of the disease.

THE PAROTID GLAND.

This is little, if at all, involved, except in those cases presenting a general septic condition. In such cases both it and the surrounding connective tissue may be totally destroyed.

THE SPLEEN.

This is usually enlarged, and in some cases may be twice its normal size. It is frequently easily palpable. In those cases where there is marked septic involvement of the throat, purulent foci of greater or less size may occur.

Case and Chart.

Case 17. - Ethel Gallantree, aged 17 years, was admitted to hospital on January 9th, 1905, with a younger brother who showed a well-marked rash. The initial symptoms - vomiting, sore-throat - appeared on the morning of January 9th, and on admission the temperature was 103.6°F., pulse 132, respirations 30. The rash appeared next day. The throat was not markedly involved, showing no patches, the tongue was typical, and the attack was one of scarlatina simplex. The temperature became normal on January 15th, and desquamation was noticed on the cheeks the day previously. The disease ran an ordinary course until the evening of January 25th, when the temperature rose to 100.8°F., the pulse was 100, and the respirations 24. An enlarged gland was noticed

at the left angle of the jaw, and this was very tender to the touch. The temperature was normal on the morning of the 28th, and only rose to 99°F. in the evening, & afterwards it remained normal. All tenderness had disappeared by the 29th, but the gland did not go down to its usual size for about a fortnight longer. She was discharged on March 6th, 1905.

THE JOINTS.

The joints are frequently involved during an attack of scarlet fever, and, according to Vogl, who investigated two epidemics occurring in 1884-85, and in 1894-95, the frequency of affection of the joints was 13.6 per cent. in the former, and 10.6 per cent. in the latter.

Many varieties of cases have been recorded under this head, and, according to Ashby, they may be classified as follows:

1. Synovitis.
2. Pyaemic Synovitis.
3. Acute or Subacute Rheumatism.
4. Scrofulous Joint Affections.

1. Scarlatinal Synovitis. - the so-called Scarlatinal Rheumatism - This is a very common complication, and its frequency varies in different epidemics. Caiger found it in 4.5 per cent. of 4015 cases. Koren (Vide Johannessen, p. 195), in the epidemic in Christiania during 1875-1877, noted 27 cases among 426- i.e., 6.3 per cent.; Hodges found it in 117 out of 3,026 cases admitted to the South Eastern Hospital of the Metropolitan Asylums Board - i.e., 3.8 per cent.; and Ashby ("On the Nature of the so-called Scarlatinal Rheumatism", Brit. Med. Jour., 1883, II, p. 514), out of 500 cases in the Children's Hospital, Manchester, saw 10 mild cases (2 per cent.), and only 2 severe cases.

This form is more frequently seen in females than in males, and in elder children and adults, usually between the ages of eight and twenty-five years, and, according to

Holt (loc. cit., p. 902), it is rare under three years of age. It occurs oftener in the smaller than in the larger joints - e.g., the metacarpo-phalangeal joints, and the wrists are more frequently attacked, although any joint may suffer. The arms are more liable than the legs, the elbows more than the knees, whilst the ankles and feet are affected much more than the latter. The articulations of the spinal column are affected in some rare cases, and this may be followed by contractures of the different spinal muscles. As a rule, it appears towards the end of the first week - i.e., when the rash is fading and the temperature subsiding; but in some cases its appearance may be delayed until the second or third week - i.e., during the period of desquamation. Its occurrence does not seem to be affected by temperature or season, as it is just as common in summer as in winter, but it is more liable to occur in the severe forms of the disease than in the mild, and in the former, especially if the throat be septic, there is a great risk of the effusion becoming purulent (Scarlatinal Pyaemia).

The symptoms are pain in the affected joint (this is nearly always present), and more or less effusion into it, with some modification of its function, redness, and a moderate rise of temperature. As a rule, more than one joint is involved, and the symptoms last for from three or four days to a week, when they disappear entirely, although in some cases the effusion may persist for several weeks, especially when the larger joints - the shoulders or the knees - have been affected. In other cases the symptoms are much more severe, the temperature is high, the pain agonising, the patient cannot bear the slightest movement of the joint or of the bed-clothes, the constitutional symptoms are marked, and the attack may last ten days to a fortnight, or even longer.

According to Trousseau ("Medicin Klinik", Bd. 1, S. 116), the constancy of the symptoms is almost pathognomonic. While the attack lasts the joint remains involved over the entire period, neither increasing or decreasing in size, as is often noticed in acute articular rheumatism. Persons who are liable to the

latter are very prone to a recurrence when attacked by scarlet fever, and scarlatinal rheumatism is liable to be followed by chorea and embolism.

The prognosis in most cases is good, as the disease readily yields to appropriate treatment, and the heart is rarely affected, only in about 3 per cent. of the cases.

For a long time past there has been a great difference of opinion as to the true nature of this complication, but at present most observers think that it has no etiological relationship with acute rheumatism, although there is a great resemblance in certain points. Both yield to salicine and the salicylates, but in scarlatinal rheumatism the tendency to migrate from joint to joint is much less than in acute articular rheumatism. Again, in the former, there is not the same liability to a recurrence of the pain (Hodge noted return of the pain in only 13 per cent. of his cases), whilst the attack is also less severe, and there is an absence of the characteristic perspiration of an acid nature. The cardiac complications - e.g., endo- and pericarditis, are not so common, but the joints are much more liable to suppurate than in the ordinary variety.

2 Pyaemic Synovitis. - Suppurative Synovitis, or Arthritis. This is much rarer than the former, and usually occurs late in the disease. The larger joints are more commonly affected, and pure cultures of the streptococcus pyogenes have been found, occasionally with other micrococci, not only in this form, but in the preceding variety also.

In the most frequent type, a large number of joints are affected, the result of emboli from the septic processes occurring in the throat. These cases present all the characteristic symptoms of an attack of septicaemia, and are usually fatal. Sometimes the suppurative process is limited to a single joint, and certain physicians, such as Henoch, have recorded cases where the purulent inflammation of the joint was a result of a rupture of a periarticular abscess into that joint.

DISEASE.

Scarlet Fever
Rheumatism

Notes of Case.

Name James Pye.

Age 12 years.

Diet

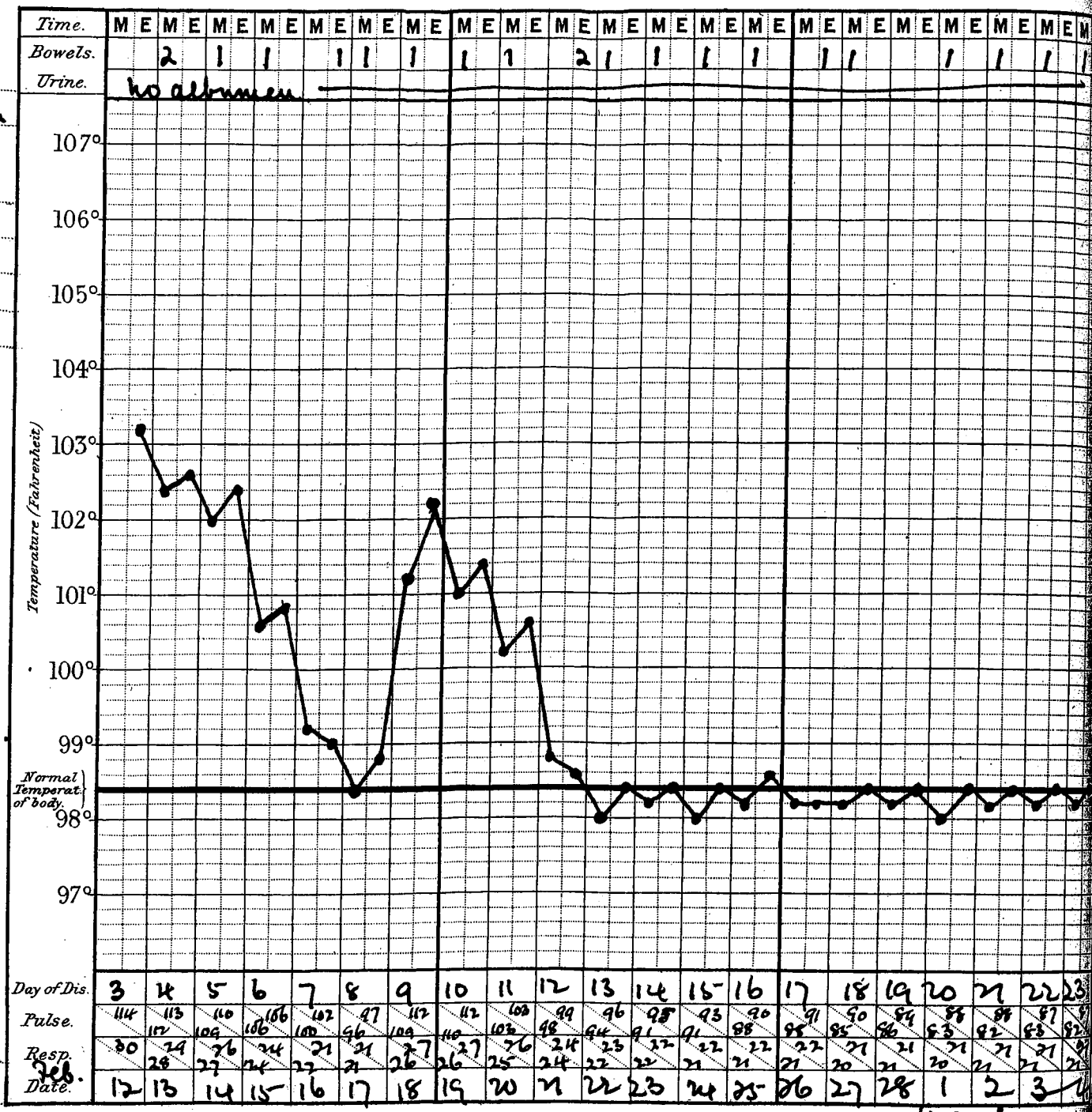
Case Book N°

No. 16.

Date of admission.

February 12th 1905.

Result Discharged on April 6th 1905



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Wodderspoon Clinical Chart

3. Acute or Subacute Rheumatism. - True rheumatism may frequently be seen as a complication of scarlet fever, and whilst it usually occurs during the period of convalescence, it may develop at the same time as the scarlatinal attack, the symptoms differing in no way from those seen in an ordinary attack of acute articular rheumatism. Occasionally scarlet fever may occur during the convalescence of a patient from rheumatism, and is apt to cause a relapse of that disease.

4. Scrofulus Joint Affections. - Bókai ("Ueber die Scharlatinosen Gelenkentzundungen", Jahr. f. Kinderh., N.F., Vol.23, 1885, pp. 304 et seq.) calls attention to "scarlatinous serous joint inflammations, which follow an acute, or may be, a chronic course, and sometimes merge into white swelling". This tubercular condition may be the result of the inflammatory process secondary to the scarlet fever.

Richardière and Peron (See Soc. Proceed., Gaz. des Hôp., Dec.5, 1893, p.1318) record several cases of marked ankylosis, and even deformity, after scarlet fever. The joints affected were the ankles, knee, elbow, and the phalangeal.

Periostitis and necrosis of the bones are also apt to occur.

Cases and Charts.

Case 18. - James Pye, aged 12 years, admitted to hospital on February 12th, 1905.

History. - On February 10th, he began with vomiting, sore-throat, and feverishness, the bowels were constipated, and the rash, which appeared on February 11th, was first noticed on the neck and chest.

On admission, he had a well-marked rash on the neck, body, legs, and arms; the tongue was the typical white strawberry, the throat was injected, and the tonsils in a swollen condition, with small follicular ulcers on each. The submaxillary glands were enlarged and tender on pressure, the temperature was 103.2°F., the pulse 114, and the respirations 30. The bowels were constipated, and the urine was free from albumen.

DISEASE.

Scarlet Fever
Rheumatism.

Notes of Case.

Name William Watts.

Age 22 years.

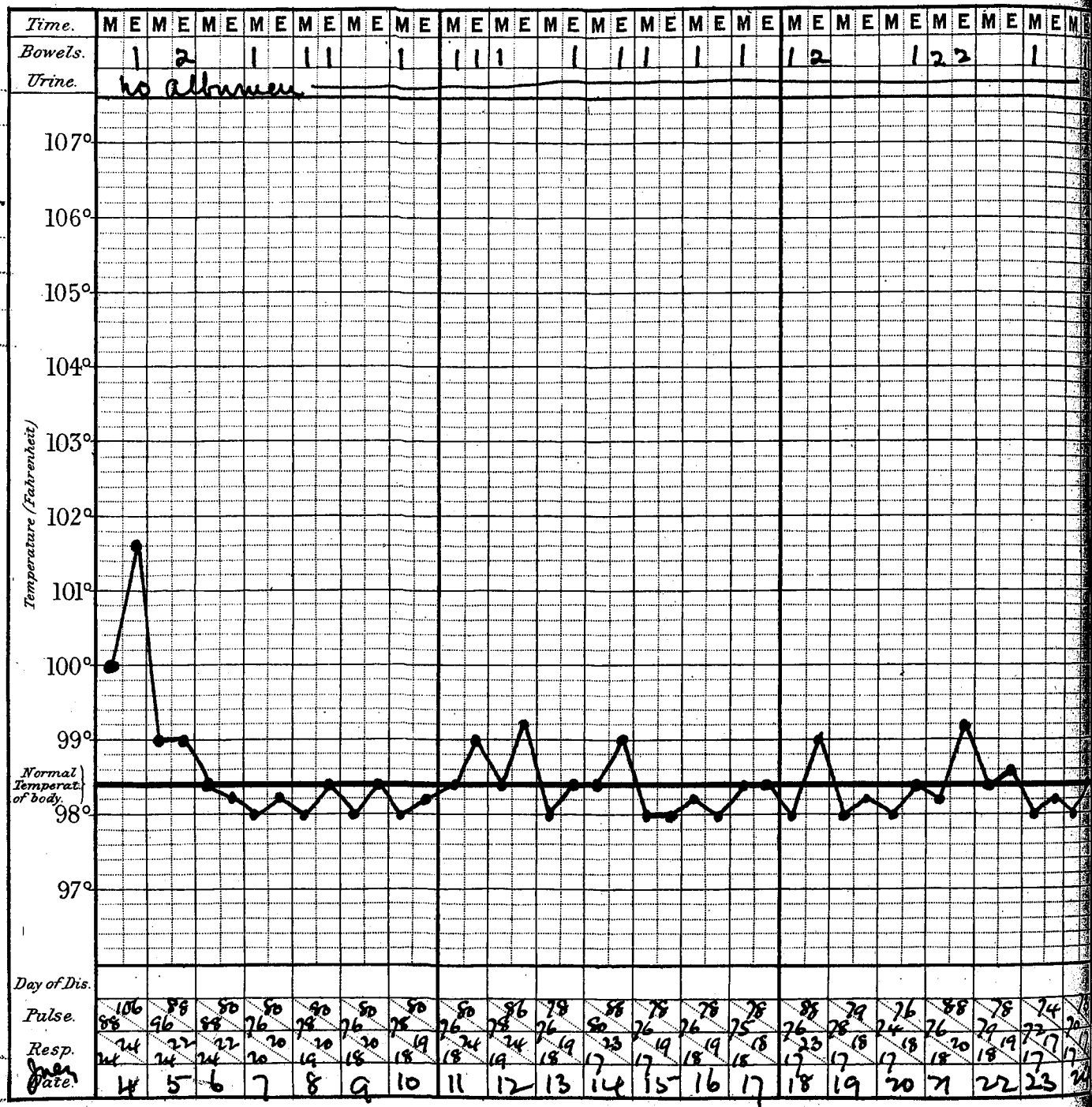
Diet

Case Book No.

No. 19.

Date of admission.
July 4th 1905

Result Discharged
August 11th 1905



Entered at Stationer's Hall. Printed and Published by Wodderspoon & Co. 6, Gate Street, Lincoln's Inn. Gould's Clinical Chart

Feb.13,1905. - Temperature 102.4°F., pulse 112, respirations 28. Tongue has peeled, condition about the same.

Feb.14,1905. - Temperature 102°F., pulse 109, respirations 27. About the same.

Feb.15,1905. - The rash is fading, temperature 100.6°F., pulse 106, respirations 24. The throat is better.

Feb.16,1905. - The rash has disappeared. Temperature 99.2°F., pulse 100, respirations 22.

Feb.18,1905. - Temperature 101.2°F., pulse 109, respirations 26. Left wrist is swollen, painful, and is red. No cardiac murmur.

Feb.19,1905. - Right ankle swollen, painful, and red; wrist about the same. Temperature 101°F., pulse 110, respirations 26.

Feb.20,1905. - Wrist and ankle not so painful, the redness has disappeared, but still swollen. Temperature 100.2°F., pulse 103, respirations 25.

Feb.21,1905. - Much better, temperature 98.8°F., pulse 98, respirations 24. Joints smaller.

Feb.22,1905. - Swelling of the joints has almost disappeared, temperature 98°F., pulse 94, respirations 22.

After this convalescence was uninterrupted, and he was discharged on April 6th, 1905.

Case 19. - William Watts, aged 22 years, admitted to hospital on July 4th, 1905. He said that on June 10th he had a sore-throat, and slight pains "all over him", but thought it was an attack of influenza. He remained indoors for a few days, but, according to him, there was no rash. He returned to work in a week's time, and continued working regularly until July 3rd, when he noticed his hands were peeling, and then, for the first time, he consulted a doctor, who sent him to the hospital the next day. On admission the temperature was 100°F., pulse 88, and respirations 24. The throat was slightly injected, and the right knee and left elbow were swollen, painful, and red. He states that the joints became affected after the doctor had seen him. Desquamation was noticed on the hands and feet, the rest of the body being clear. The bowels were constipated, and the urine

contained no albumen. The temperature at night was 101.6°F.

July 5th. - Temperature 99°F., pulse 96, respirations 24. The joints are not so swollen, but they are still painful.

July 6th. - Temperature normal. Pain has disappeared, but joints still swollen.

July 10th.- The swelling of the joints has disappeared.

July 11th.- Temperature in the evening 99°F., right wrist is swollen and painful.

July 12th.- Temperature in the morning 98.4°F., evening 99.2°F. The joint is about the same.

July 13th.- Joint is still swollen, but not painful, Temperature 98°F.

July 14th.- The wrist is much smaller, but the second metacarpo-phalangeal joint of the left hand is swollen. Temperature in the evening 99°F.

July 15th.- The joint is not painful, but is still swollen. Temperature 98°F.

July 17th.- The swelling has now disappeared.

July 18th.- Left ankle swollen and painful. Temperature in the morning 98°F., evening 99°F.

July 19th.- Ankle still swollen, but no pain. Temperature 98°F.

July 21st.- Left ankle still slightly swollen, but now has pain in the right wrist which is also swollen. Temperature 99.2°F.

July 22nd.- Temperature is normal, but the wrist is slightly swollen.

There was no further rise of temperature; no other joints were affected, and desquamation was complete on August 8th. He was discharged on August 11th.

THE HEART.

The changes occurring in the heart in scarlet fever have been investigated principally by Romberg ("Ueber die Erkrank. des Herzmuskels bei Typhus abdominalis, Scharlachs, u. Diphtherie", aus der Med. klin., Leipzig (Curschmann), Deut. Arch. f. klin. Med., Bd.48,

S.369; u. Bd. 49, S. 413), who states that there is no doubt that the scarlatinal poison alone is able to cause serious damage to that organ. He also says that in the early days of the disease, the poison may cause a marked dilatation of the heart, though he has only seen this occur in severe cases; and Hänoch also says that the danger to the heart is very great in those severe cases where death occurs at a very early period of the disease.

The symptoms are usually as follows: There is well-marked tachycardia, the pulse is irregular, rapid, and small, and in some cases intermittent, whilst in the later stages we notice a bradycardia. As the disease progresses, the pulse usually becomes more rapid, often so as to be uncountable, more irregular, and frequently very intermittent, and the heart sounds may run together so that they cannot be differentiated. Those parts of the body furthest from the heart become cold and cyanotic, or pale, symptoms which can only be due to cardiac failure.

According to Romberg, these symptoms are due to an affection of the myocardium and, according to him, the cardio-nervous system is but little involved.

Sometimes in the late stages of scarlet fever, running its course without any complications, we may notice a slow and gradual development of weakness of the heart. In these cases a bradycardia (diminution in frequency of the pulse) occurs, though, on the whole, not so often as in most of the other acute infectious diseases.

Instantaneous death, without any previous warning, due to a sudden cessation of the heart's action, has been observed in a few cases, though not nearly so often as in diphtheria.

Schmaltz (Mün. med. Woch., 1904, p.1417) has investigated the cardiac changes in scarlet fever. He has studied 191 clinical cases, in none of which the cardiac changes were associated with either sepsis or nephritis, and amongst this number he found 35 per cent. showed abnormal conditions of the circulatory apparatus. This

complication varies in different epidemics, for example, he found in 70 consecutive cases with only one death, 38 showed marked cardiac disturbances. During the first febrile period of the disease, there is a marked tachycardia, a pulse-rate of 150-160 in children, and 120-140 in adults, being very common, and not of any ill omen. As the temperature falls, the pulse-rate also falls rapidly, frequently below the normal rate, and a pulse of 55 has been frequently observed. In other cases, the fall of the pulse-rate is more gradual, whilst in others it may remain rapid though the temperature has become normal.

In some cases the pulse at a later stage becomes rapid, and when this is extreme, we are justified in saying that a disease of the heart certainly exists. Systolic murmurs, which may appear as early as the first day of the disease, but more frequently at the end of the first or during the second or third week, are often heard over the heart, and are usually looked upon as being due to the febrile state. These murmurs may either disappear, or continue for a long time, and in addition we may have accentuation of the pulmonary second sound. The cardiac dulness may remain unchanged, but frequently we notice the area of dulness to be enlarged to the left, and not so often to the right and upwards. According to Romberg, this cardiac dilatation only occurred during the febrile stage, but Schmaltz says it is more common in the later than in the earlier stages.

Arhythmia frequently occurs, but even in severe cases it may be absent. The subjective disturbances are not well-marked, and consist of a little palpitation, and perhaps moderate dyspnoea, and compared with the symptoms of cardiac complications of diphtheria, they are slight.

According to Schmaltz, no relationship exists between the severity of the scarlet fever and the liability to cardiac complications, and also there is none between the so-called scarlatinal rheumatism and these complications. In 23 cases of scarlatinal rheumatism 10 had cardiac changes, and in nearly 70 in which there were

cardiac symptoms, none showed joint changes. Pre-existing heart lesion did not appear to exert any influence, as in 26 of such cases, 17 showed no signs of cardiac involvement. As a rule, either in a longer or shorter period of time, the murmur, the accentuation of the pulmonary second sound, and the cardiac dilatation disappear. He, however, relates that out of 29 cases which left the hospital with cardiac symptoms, and which were examined at different times, 18 still showed cardiac changes, and of these there were 16 which showed an accentuated pulmonary sound, a systolic murmur at the apex, and an increase of the cardiac dulness to the right, in fact symptoms of mitral incompetence.

He considers these murmurs to be due to changes occurring in the myocardium, and that the incompetence of the mitral valve for a long time is due to the myocarditis only, but at a later stage the valves become altered, in a way which at present cannot be satisfactorily explained.

In those cases of scarlet fever complicated by acute nephritis, we notice an acute dilatation, followed by hypertrophy of the heart. These changes are more common in children than in adults, for in the former the heart muscle is much more yielding than in the latter. Most frequently the enlargement is on the left side (ventricle), but both may be affected. In these cases we may notice a tachycardia, with rapid pulse, but usually, and especially when uraemia threatens, there is more or less slowing of the pulse, due to the increased valvular tension.

As a rule, we are only able to diagnose the enlargement clinically in severe cases, and murmurs may be heard, due to the dilatation and not to any endocarditis. If the condition producing the dilatation be of short duration, it is quite possible for the heart to return to its original size, but if, on the other hand, it lasts for a sufficient time, a compensatory hypertrophy is sure to follow.

Endocarditis is not very common, but when it does occur, it affects the cardiac wall rather than the valves, and if the latter be affected it is usually at the mitral orifice. It is impossible to diagnose mural endocarditis. In 13 cases of Schmaltz, and 20 collected by Schmorl, endocarditis only occurred in 3; and, according to Curschmann (Deut. Arch. f. klin. Med., BD. 49, S. 437), many cases of scarlet fever after a year or so, display real valvular lesions, due to an extension from the mural endocardium, subsequently involving the valvular endocardium.

Endocarditis is more common in cases complicated by nephritis than in simple scarlet fever, and it may be that many murmurs heard are put down to endocarditis when they are really due to a change in the myocardium. When there is a septic infection, the endocardium is very apt to be involved, and also in those cases where inflammation of the joints has occurred, it is a frequent complication; according to Hodges (Cited by Eichhorst, p. 241), it occurs in 32 per cent. of all cases.

Pericarditis occasionally occurs in cases of simple scarlet fever, but is more common in those cases complicated by nephritis, septic processes, or by involvement of the joints. The exudation into the pericardial sac may be serous, sero-fibrinous, or, more rarely, purulent, whilst it may also be variable in amount. When very large, it may cause a difficulty in diagnosing between it and dilatation and hypertrophy of the heart.

Sometimes in septic cases all the three structures of the cardiac wall may be involved, causing a pancarditis.

THE RESPIRATORY TRACT.

Oedema of the glottis is a very serious complication, frequently ending in death, and may be the result of extension of the inflammatory process in the immediate neighbourhood, or it may be due to nephritis.

A case of oedema of the glottis in a child, 5 years of age, occurring during the period of convalescence after a mild attack of scarlet fever, is reported by J.C. Gittings (New York Med. Jour., July 25, 1903).

According to Kraus (Prag. med. Woch., 1899, Nos. 29, 30) perichondritis of the larynx may occur once in 200 or 250 cases, and he reports a case which was diagnosed during life, the accuracy of the diagnosis being confirmed at the post-mortem examination.

The bronchi are also apt to be involved, and, according to Henoch ("Vorles. ueber Kinderkr.", S. 642, 3d ed.), they are affected more frequently than we would usually suppose. He says that bronchitis and broncho-pneumonia occur during the first and second weeks of the disease, but are usually overlooked, because they are disguised by more severe symptoms. He also states that "we found bronchitis and broncho-pneumonia in nearly all the severe cases, and also repeatedly during life". According to Caiger, bronchitis occurs in 1.12 per cent. of all cases.

In those cases characterised by well-marked symptoms in the throat, bronchitis and broncho-pneumonia may be the result of an extension of the disease downwards from the throat, or may be due to the entrance of food or of septic matter into the bronchi. At other times they may be the result of emboli in the lungs, usually from the right side of the heart, and when these emboli are septic, small abscesses form in the lung, and gangrene may even occur.

True croupous or lobar pneumonia is more common when the disease is complicated by nephritis, but even then it is very rare.

Acute oedema of the lungs is apt to occur with nephritis, and is usually fatal.

Case and Chart.

Case 20. - Winnie Chattaway, aged 5 years, was admitted to hospital on March 8th, 1905. According to the

history, the illness began on March 1st, with vomiting, sore-throat, and feverishness, and the rash appeared the next day. On admission the temperature was 99°F.; and the rash was scarcely perceptible. The urine contained no albumen. Desquamation was noticed on the neck on the 13th. Her convalescence was favourable, until the evening of April 3rd, when the temperature rose to 99.8°F.

April 4th. - Temperature in the morning 100°F., evening 101.6°F.; well marked tubular breathing at the left apex, extending down for three fingers' breadth below the clavicle. The temperature reached the highest point on the evening of April 5th. The pneumonia ran an ordinary course, and the temperature became subnormal on the morning of April 10th. She was allowed up on the 18th, and was discharged on May 7th, 1905.

THE PLEURAE.

The pleurae are sometimes involved in simple scarlet fever, usually about the middle of the second week. There may be no exudation, whilst at another time it may be very abundant; and although serous at first, it usually becomes purulent, owing to a secondary infection. As a rule, it is unilateral. Sometimes the pleura is affected by extension from the lungs - e.g., in pneumonia, infarcts, etc., but it is usually mostly involved as the result of nephritis. According to Henoch, it is frequently involved in scarlatinal rheumatism.

Thomas says all forms of pleurisy have a rapid development, and although very extensive, may only cause moderate local disturbances, and in this he is corroborated by Fürbringer, who also states that typical pleurisy with effusion occurs in about 5 per cent. of all cases. According to most authorities, these pleural exudates are usually purulent, and Henoch says "almost always." Streptococci have been found in them by O. Vierordt.

Litten has drawn attention to the sudden development of pleurisy with effusion. He says: "There are cases of scarlatina in which during the convalescence

dyspnoea suddenly appears, and without warning. In such cases, then, without any other complication being present, and especially in the absence of joint affections, there may develop in a few days a serous pleuritis with a marked exudate. The prognosis in such cases is always bad. Analogous observations have already been made by Andral".

Case and Chart.

Case 21. - Florrie Crabtree, aged 7 years, admitted to hospital on November 4th, 1904. The initial symptoms appeared on November 1st, and the rash next day. On admission on November 4th, the temperature was 102°F., pulse 126, and respirations 29. She was a very delicate child, but the attack seemed to be an ordinary one. The throat was injected, no patches were seen, the glands under the jaw were enlarged and painful, the tongue was the typical red strawberry, the bowels were constipated, and the urine was free from albumen. On the morning of the next day, the temperature had fallen to 99°F., but rose to 101.2°F. in the evening. The next evening it was 104°F., and on the morning of the 7th, 103°F. Dulness was found at the base of the right lung, extending as far upwards as the angle of the scapula, and over this area tubular breathing was well marked. There were no friction sounds to be heard. The case was diagnosed as lobar pneumonia. The temperature remained high, and did not reach the normal until the morning of the 16th, but after that date it showed signs of septic mischief, so, a hypodermic syringe was introduced, with all antiseptic precautions, into the sixth interspace, in the mid-axillary line, and pus was drawn off. The parents were advised to sanction an operation to be performed upon the child, but would not give consent. The temperature continued to show a septic character, the child steadily went from bad to worse, emaciation was extreme, and when they were convinced that the child would certainly die unless something were done, they yielded. On the evening of December 10th (the night before the operation was performed), she coughed up about six ounces of pus. On

the morning of December 11th, a piece of the sixth rib was excised about one inch in front of the mid-axillary line, and about twelve ounces of pus escaped through the wound. She was in such an exhausted condition that we had grave doubts at one time whether she would come round from the anaesthetic. The operation was conducted on the usual lines, and a rubber tube, about three inches in length, was introduced into the pleural sac. The dressings were changed twice a day for a week, as the discharge was very copious, after then only once a day; the temperature was 99°F. on the day after the operation, but was subsequently normal. The tube was shortened in 10 days, removed at the end of the third week, and the wound had completely healed in a month from the operation. She gradually grew much stronger, and when she was discharged on March 7th, 1905, was quite plump and strong.

RENAL LESIONS.

While affections of the kidney are not so frequent as some of the other complications of scarlet fever, their occurrence, nevertherless, is always accompanied by very grave risk to the patient. There is little doubt, although at present we cannot say with absolute certainty, that these changes are due to the influence of the scarlatinal poison upon the kidneys; and, in addition, inthose cases where there is septic infection as well, other organisms must play an important part.

Frequently it has happened that, on making a post-mortem examination of patients who have died from scarlet fever, grave lesions have been found in the kidneys, which during life gave rise to no symptoms, in many cases no doubt being masked by the severity of other processes. The occurrence of renal changes is very uncertain, but no case of scarlet fever is so mild that it may escape, whilst, on the other hand, in many severe types the kidneys are not affected. In childhood, scarlet fever is the most frequent cause of the occurrence of nephritis, and some German authorities consider the albuminuria of scarlatina to stand in the same relation as the bronchial catarrh of measles.

These renal changes are all characterised by the occurrence of albuminuria in varying amount, and it will perhaps be as well to discuss them according to the time of their onset.:

1. Albumen is frequently ~~frequently~~ found in the urine in the first few days of scarlet fever, and is to be looked upon as due to the febrile process, - the so-called Initial or Febrile Albuminuria. According to Eichhorst (p.239) it occurs in as many as 77.6 to 92 per cent. of all cases, and in most instances it appears on the second or third day of the disease. After lasting for three or four days, it usually disappears when the fever subsides - i.e., about the end of the first week, but in some cases may be followed by the development of a genuine nephritis. The urine usually contains mucus, and cylindroids, rarely epithelial, hyaline, or bloody casts. This febrile albuminuria is identical with the albuminuria which occurs in all acute infectious diseases characterised by a rise of temperature, and as it is supposed not to be associated with any structural alteration in the kidney, is not looked upon as being of any special importance.

2. Sometimes, in those cases of scarlet fever in which death occurs in 48 or 72 hours from the beginning of the illness, grave lesions are often found in the kidneys at the autopsy, such lesions being due to the severity of the scarlatinal poison, or perhaps to some other intercurrent complication, but in those cases where the disease is of moderate severity, albuminuria is frequently seen, and to these Friedländer ("Ueber Nephritis Scarlatinosa", Fort. der Med., Bd. 1, S. 81) has given the name of "Initial Catarrhal Nephritis". This form usually occurs either with or immediately after the appearance of the exanthem, and is characterised by its mild character. It appears to be due to a catarrhal inflammation of the tubules of the kidney. A slight amount of oedema is noticed in only a few cases, and the urine, in addition to containing albumen, frequently shows under the microscope, degenerated epithelial cells and mucous cylindroids. In some cases, casts, either epithelial or

hyaline, and red or white blood-corpuscles may occasionally be noticed. This form is usually of short duration, and does not last many weeks, and in some cases no trace of it can be seen when the urine is examined microscopically during the second week, but we must bear in mind that frequently in these cases a slight trace of albumen and even casts may be seen to continue up to the time of the appearance of the true post-scarlatinal nephritis, although in the great majority of those cases which may afterwards be complicated by post-scarlatinal nephritis, all traces of the initial catarrhal nephritis disappear, the urine being quite normal as far as can be ascertained by examination, and hence we may think there is no active change going on in the kidney.

3. In the haemorrhagic form of nephritis the patient may die within the first three days of the attack, and in such cases we notice a great diminution in the quantity of the urine; albumen would be present, and usually more or less haematuria, although it is not uncommon for the last symptom to be absent.

4. Septic Nephritis. - This form is seen in those cases characterised by septic infection, and usually occurs when there is marked involvement of the pharynx. It is due to the severity of the scarlatinal poison, associated with the streptococcus pyogenes. These cases usually occur during the first week or early in the second, and the changes produced in the kidneys are most marked. The urine in most instances contains albumen, casts, and blood, all of these in a greater or less amount, though there are cases on record where the urine was normal throughout the attack. As a rule, there is no dropsy, and uraemic symptoms do not occur. Frequently there is no suspicion of involvement of the kidneys, as owing to the severity of the septic infection, the symptoms are masked by those referable to other organs, in fact, the state of the patient shows a grave septicaemic condition, and although no symptoms of renal mischief were recognised during life, the autopsy shows them to be affected in a marked degree.

5. Post-scarlatinal Nephritis. - By this is meant the development of nephritis after the acute scarlatinal symptoms have subsided, and whereas the nephritis developing during or just after the acute stage is not confined to the glomeruli, but frequently affects the tubules as well, this form is usually looked upon as being essentially glomerular. Its occurrence varies in different epidemics, in some it is as high as 90 per cent., whilst, according to some authorities (e.g., Bartels, E. Wagner), other epidemics are characterised by its absence. According to Vogl, in one epidemic observed by him, it was 34 per cent.; and in 875 cases of scarlet fever treated in the Elizabeth Hospital at St.Petersburg from 1871 to 1886, Hertzka found nephritis in 138 - i.e., in 15.7 per cent. Steiner says its occurrence varies from 5 to 70 per cent., and Owen Fowler found it to occur in 14 per cent. of his 2,000 cases. Johannessen, in Norway, out of 36,230 cases which occurred from 1873 to 1878 inclusive, found dropsy and Bright's disease in 7,897 - i.e., in 21.7 per cent., but in some epidemics he found the percentage to be as high as 70 to 90 per cent. In the cases recorded by Friedländer, it was 18 per cent.; and Ashby (Ashby and Wright, "Diseases of Children", p. 365), after taking the average for several years in cases occurring in his hospital practice, found that about 6 per cent. developed post-scarlatinal nephritis. Caiger (Allbutt, Syst. of Med., Vol.II,p.151), out of 4015 cases found acute nephritis to occur in 3.41 per cent.; whilst Cadet de Gassicourt (Cited by Moizzard, p. 148) noted a late scarlatinal nephritis in 30 per cent. of all his cases.

Causation. - As to the cause of post-scarlatinal nephritis, many theories have been advanced. The oldest is that it is due to "catching cold", but Owen Fowler, in denying this, maintained that it occurred most frequently in summer. As long ago as 1864, Mayr (p.207) said he had not seen any bad results from exposure even to the severest weather; and Henoch also says: "The idea, that many are contesting even today, that nephritis is the result of a "cold", or of a suppression of epidermal perspiration, is shared by me in no degree whatsoever, for

almost all my cases have originated in spite of the most scrupulous care, and only a few children have left their bed a few days too soon".

Bartels also says he has seen the most severe cases of involvement of the kidneys to occur in the convalescent period of scarlet fever, in patients whose parents have been so anxious that they have kept them in bed, whereas children who have run about the streets, whilst suffering from scarlet fever, have escaped.

Although this theory has been proved to have no foundation, it must be understood that it is not wise to expose any scarlatinal case unnecessarily.

Caiger says that cold by itself does not cause nephritis, but is apt to do so when associated with a dampness of the atmosphere, and he also says that it is more frequent in cold, damp, or "muggy" weather, in other words, its causation depends greatly upon the atmospheric humidity.

The occurrence of nephritis has also been thought to be due to a "fluxion of blood" - i.e., with the appearance of the rash there is a hyperaemia of the skin, and anaemia of the kidneys and other "internal organs", and this is followed by anaemia of the skin, and consequent hyperaemia of the kidneys and other "internal organs".

Others have thought that it was due to the fact that more elimination was thrown upon the kidneys, owing to the skin being prevented from excreting, but, on the other hand, it has been said not to be more liable to occur in cases in which the rash is most fully developed. Some thought the rash and desquamation were the result of an effort on the part of the skin to get rid of the poison, and when these were not present, or only very slight, then the kidneys tried to eliminate it, with the occurrence of a nephritis as the result.

According to Leichtenstern, the poison is absorbed from the skin, and causes stasis in the lymphatics: owing to this, dropsy or inflammatory oedema is produced, which,

being eliminated by the kidneys, causes nephritis; and he explains those cases in which it occurs from getting up too soon, by saying that the movements of the body cause a quickening of the lymph stream, and hence a quicker absorption of the poison.

Some of the old writers thought that the nephritis was due to a localisation of the poison in the kidney, and was an essential part of the disease; whilst others, with its occurring more frequently during the stage of desquamation, were of the opinion that a real desquamation took place in the uriniferous tubules.

The generally accepted theory at the present time is the one propounded by v. Jürgensen, that the scarlatinal toxine circulating in the blood is eliminated by the kidneys, and so causes the nephritis by exerting an inflammatory action on these organs, and as its occurrence varies in different epidemics, we are obliged to consider personal peculiarities (idiosyncrasy) of each patient. This authority says it is most remarkable that in one epidemic the kidneys of all scarlatinal patients will be affected by the poison, whilst in another, they do not seem to be affected by even large quantities of the poison. He thinks the best explanation of this is, that, as a rule, the nephritis occurs in the later stages of the disease, and the toxine may have been retained in the body for a long time, so that it is changed and weakened, and when excreted by the kidneys does not cause any inflammation; whilst in other cases the virulence of the poison has been very great, and the diluting force insufficient, consequently when excreted, nephritis is the result. Again, in some instances, the poison may pass so slowly and gradually through the kidney, that it is never in sufficient amount to cause any irritation, but if, on the other hand, large quantities are excreted at one time, there may be a temporarily sufficient accumulation in the renal circulation, which might cause inflammation. These theories would, of course, equally account for the changes described under the term of "initial catarrhal nephritis".

Many French observers, amongst others Marie, Haskin, and Babes, have found streptococci in nearly all the forms of scarlatinal kidney. According to the latter he found these micro-organisms in 26 out of 30 cases. On the other hand, other observers have not been able to demonstrate their presence.

Post-scarlatinal nephritis appears to occur less frequently in hospital than in private practice, at any rate amongst the poorer classes, for the latter will be better nursed in the public institutions, and more attention is paid to bathing, especially during the most susceptible period of the illness. It is impossible for anyone to forecast the occurrence of nephritis, even if the attack be very mild. It is just as liable to occur in a mild case as in the most severe, and the latter may escape just as the former may be attacked, but, as a rule, we are justified in saying that the chances are less of its occurring in mild cases than in the severe. Certain families seem to be predisposed to the occurrence of renal disease, perhaps, this predisposition may be the result of the defective elimination of other organs, - the skin, the gastro-intestinal tract, etc.

Age. - It is liable to occur at all ages, but the most susceptible period is from the second to the fifteenth year, after which time the susceptibility diminishes. It occurs equally in both sexes up to the age of fifteen, but later, males are more frequently affected than females.

According to Hertzka, of 132 cases of nephritis occurring in the Elizabeth Hospital of St. Petersburg there were:

Under 1 year	25	cases,	1	case of nephritis	- 4 p.c.
Between 1&2 years	107	"	5	cases " "	4.6 "
" 2&3 "	106	"	12	" " "	11.3 "
" 3&4 "	79	"	16	" " "	20.2 "
" 4&5 "	86	"	20	" " "	23.2 "
" 5&6 "	82	"	18	" " "	21.9 "
Above 6 "	360	"	60	" " "	16.6 "

According to this table, children under 2 years are not so frequently attacked.

Symptoms. - As a rule, the first symptoms are noticed at the middle or end of the second week of the disease. Von Jürgensen says the most common time for the commencement of the symptoms is during the third week; Jaccoud - the tenth to the fifteenth day; and Thompson- during the second third or sixth week. Most observers say between the tenth or twelfth, and the twenty-first day, though some maintain that it may occur as late as the ninth week, whereas Fürbringer says it never occurs after the sixth week.

According to Caiger (Loc. cit., p.154), many cases at this period develop a "Simple Albuminuria", which he considers to be essentially due to the same process as the acute nephritis, but, of course, in a very modified form. He found it to occur in 4.28 per cent. of 4015 cases, and no case was included in which the albumen was present for less than three consecutive days. As a rule, it lasted for only a few days, but there is a great tendency for it to end in acute nephritis. These views of Caiger are shared by Henoch.

Under this heading we must mention those cases of so-called "Postural" or "Cyclic Albuminuria". In these, the examination of the urine on one day may reveal the presence of albumen, whilst on the next there may be absolutely no trace. Caiger (Loc. cit., p. 156) records the case of a boy, who when in bed had no albuminuria, but in whom the albumen could be made to vary from 0 to ½ by getting him up for half an hour. On returning to bed, or on lying down in his clothes for an equal period of time, the albumen would diminish to a mere trace, and this alteration could be repeated at will for two months. It is not known whether this albuminuria is followed by kidney disease.

In some cases, especially those in which the scarlatinal attack has not been recognised, the true post-scarlatinal nephritis develops with sudden and

well-marked symptoms. Frequently attention is first drawn to the occurrence of a rigor, which is followed by headache, drowsiness, and vomiting, and the patient complains of anorexia, thirst, and frequently pain in the back. The temperature shows a sudden rise to 103° or 104° F., the urine is diminished in quantity, often in a great degree, contains blood and albumen, and the bowels are constipated. The pulse is quickened, and of high arterial tension; and Mahomed has described a pre-albuminuric tension of the arteries, - a condition which has been disputed by many observers. The respirations are more rapid, the tongue is coated and dry, the skin feels hot and burning, and there is more or less anasarca of the face, the hands, the feet, and the loins. The urine is greatly diminished throughout the whole of the febrile stage, and, on the second or third day, the quantity passed may amount to only a very few ounces, - perhaps four or five in all. The patient complains of a frequent desire to micturate, and of strangury, and the urine, in addition to albumen, contains blood and casts. The temperature shows a peculiar characteristic: it lasts for about a week, and exhibits such great variations, that the chart frequently resembles one of pyaemia - i.e., it has a spiked appearance, a low morning and a high evening rise. When the temperature falls to the normal, the urine is excreted in greater quantity; the haematuria lessens, and the pulse becomes much fuller, and perhaps may be slower than normal.

In the majority of cases, the onset is much more gradual. When the urine has been methodically examined from day to day, we first notice a diminution in the quantity passed during the twenty-four hours; and this is followed by the appearance of albumen; and also by an increase in lithates: as the quantity of urine lessens the amount of albumen increases. According to Baginsky, there may be noticed in some cases an increase in the quantity passed before the development of the albuminuria. The patient now complains of headache, loss of appetite, thirst, and pain in the back shooting down the thighs, or of an oppressive feeling in the loins. The lumbar pain

~~pain~~ is supposed to be due to the stretching of the capsule by the swollen kidneys. The patient is irritable and restless, and there is more or less vomiting, due to the same cause as the lumbar pain, whilst constipation is the rule. The skin has a peculiar pallor, and the temperature is only slightly raised, - not more than, as a rule, ½ to 1½ degrees; and, though this slight rise may persist for a few days, it soon returns to the normal. Many writers lay great stress upon a slight rise of temperature following the normal (even of half-a-degree), as one of the earliest evidences of a threatened nephritis. In some cases, especially when uraemia develops, the temperature may become high.

Micturition is frequent, especially in those cases showing a polyuria before the albuminuria appears; and the pulse is of high tension and rapid, but becomes slower later on in the disease. In some cases the pulse is soft and easily compressible. When uraemia occurs, the pulse is usually slower, and apt to be irregular as well.

The urine is diminished in amount (in some cases there may be complete anuria), of a smoky colour, due to the existence of altered haemoglobin, and with a more or less dark reddish-yellow sediment of altered epithelium, tube-casts, and red and white blood-corpuscles. Haematuria, to a slight degree, is a common symptom, even when the amount of albumen is small; and, as a rule, the blood disappears from the urine before the albumen; and in those cases showing much haematuria the urine may be of a bright red hue. The reaction is always acid (at any rate, before any treatment has been carried out); and the specific gravity, which depends upon the quantity passed, varies from 1004 to 1040. In some cases the specific gravity may be 1065, though this is exceptional; but Saundby ("Lectures on Renal and Urinary Diseases", p. 101) says some of the densest urines met with are seen in scarlatinal nephritis. The quantity of urea varies with the amount of urine, and also with the specific gravity; it is usually about 1 per cent., rarely more, although it may be as high as 2 per cent; whilst the

amount of albumen is variable, - in some cases it may vary to a great extent from day to day, and may even disappear, to return after a day or two, especially when the nephritis is clearing up. In severe cases it may be 1 per cent., or even higher; but, as a rule, it varies from 0.05 to 0.1 per cent.

Microscopically, we find red and white blood-corpuscles, hyaline, epithelial, granular, fatty, and blood casts, and also fragments of renal epithelium, along with granular débris. Uric acid and oxalic acid may be present, both in the crystalline and the amorphous form.

Tests for Albumen.

Before proceeding to test for albumen, it is essential that the albumen be perfectly clear, and if turbid it should be filtered. The reaction should next be ascertained, and, if necessary, enough acetic acid should be added to it to make it faintly acid before proceeding with the first test.

1. Heat Test.- When the urine is boiled in a test-tube, if it remains perfectly clear, no albumen is present. If a cloudiness form, it may be due to albumen or earthy phosphates. The latter disappear on the addition of a few drops of nitric acid, the former remains.

2. Heller's Test.- Place a little pure nitric acid at the bottom of the test-tube, and then by means of a pipette allow some of the urine to float on its surface. If much albumen be present a white ring is formed at once at the junction of the two liquids, but if in small amount the ring will form only after standing.

The fallacies of this test are: Albumose is precipitated in the cold, but on heating it disappears, only to reappear on cooling. Many resinous bodies (e.g., copaiba) are excreted by the urine, and are precipitated by nitric acid, but this precipitate is soluble in alcohol. Care must be taken in adding alcohol

to urine containing nitric acid, as an explosion is apt to occur.

3. Picric Acid Test.- The addition of a cold saturated solution of picric acid to a urine containing albumen gives a white precipitate.

The objection to this is that it also precipitates the mucin and peptones. The precipitate when due to peptones disappears on heating, as also does that due to quinine.

Tests for Blood.

1. Guaiac Test.- Place about one inch of urine in a test-tube, and add to it two or three drops of tincture of guaiacum. Owing to the partial precipitation of the resin, a white precipitate forms. Carefully add one inch of ozonic ether, and do not shake. If blood be present, a blue colour appears at the junction of the two liquids.

The fallacy is that the iodides when present in the urine give a blue colour, but are distinguished by its appearance throughout the fluid, and not at the junction of the two; and it also appears much more slowly.

2. Heller's Test.- Place about two inches of urine in a test-tube, and add enough caustic soda to render it slightly alkaline; then boil. When blood pigment is present a brownish-red deposit forms, and the supernatent fluid becomes of a bottle-green colour.

Fallacies: This result may be given when no blood is present if the patient is taking rhubarb, senna, or santonine. Spectrum analysis of the precipitate will determine if blood be present.

Ehrlich's Diazo-Reaction.-

This sometimes occurs. Brewing found it three times in six cases, and noticed it to be most marked at the beginning of the eruption, and disappearing during

the stage of desquamation. Niessen found it 11 times out of 23 cases. According to most observers, it is more frequently absent than present, and is of no value in scarlet fever.

Other Substances.

The urine in scarlet fever also contains a little mucin, and in some cases peptonuria and propeptonuria may occur. Some authorities (e.g., Senator, Pacanowski, and Binet) have found peptonuria in scarlatinal urine; whilst Petri, Sior, and Schielter could not find it under any circumstances. According to Arslan Ervant, peptonuria does not occur in normal cases of scarlet fever, but always in complications, and when it is present the prognosis is grave. He says it is not simultaneous with albuminuria but with indicanuria.

A toxine has been extracted from the urine of scarlatinal patients, but is looked upon as being a derivative.

Oedema.

This usually appears after the albuminuria, though, according to Henoch, some few cases occur in which it is absent. It is first noticed about the eyes and ankles, perhaps more marked on one side than the other, and appears as a slight puffiness of the lower eyelid, so that the space between the eyelids is smaller owing to this swelling. It may also be seen upon the knuckles, and upon the dorsum of the hands and feet, very early in the disease, and may very in amount from day to day. In the majority of cases, oedema is not present in great amount, but sometimes it is well-marked, especially in those in whom the scarlet fever was not recognised, or in cases when the patient has been neglected. The face may be very oedematous, in fact so much so that the eyelids are practically closed, and the legs and feet may also be very swollen and pit readily upon pressure, whilst in extreme cases the external genitals may be also involved. The skin is dry and of a whitish-yellow colour.

In exceptional cases the skin and subcutaneous tissue of the entire body may be swollen, oedematous, and tense, whilst in rare cases it may be actually tender owing to the extreme degree of tension, and in some parts of the body - e.g., the legs, the skin may rupture owing to the extreme tension, and the fluid which oozes from the points of rupture may cause severe irritation to the surrounding tissues.

Sometimes we find fluid in the peritoneal, pleural, and pericardial cavities, and in many instances sudden oedema of the lungs, glottis, brain (of the pia mater, cerebral substance, or cerebral ventricles - Mayr, loc. cit., p. 211) may occur, and cause a speedy fatal termination.

The peculiarity of the scarlatinal oedema is that it develops more universally, more quickly, and more enormously than in any other form of nephritis, and this peculiarity is characteristic of scarlet fever. It is said to be due, not only to the nephritis, but also to the action of the scarlatinal poison on the skin; and Leichtenstern believes that the irritation of the scarlatinal toxine takes place in the lymphatic vessels, but Cohnheim thought it was due, in common with other forms of dropsy of the skin, to changes in the blood-vessels.

In some cases nephritis may occur without any symptoms; and, according to some writers, dropsy may be present without albuminuria, - an exceedingly rare occurrence.

In the great majority of cases showing symptoms of moderate severity, recovery takes place; and, as a rule, improvement sets in early, often in the second or third week, and, at the end of this time, or very soon after, the urine is perfectly normal. In other cases the albuminuria may persist for a much longer period, and in some cases may become chronic. I am frequently consulted by a lady who has albuminuria - the result of scarlatinal nephritis thirty-five years ago, when eleven years of age.

Death in post-scarlatinal nephritis is usually due to uraemia, or to suppurative inflammation, or to acute pulmonary oedema. The last is by far the most dangerous to life.

Uraemia.

The appearance of uraemia is usually preceded by prodromal symptoms, such as vomiting, diarrhoea (occasionally), headache, and irregular twitchings. In some cases on record, the development of uraemia was the first symptom of nephritis; and Leichtenstern (Deut. med. Woch., 1882, pp. 246-248), in the Cologne epidemic, saw three cases, in all of which the urine had been tested three or four hours previously, and was free from blood and albumen. A period of complete anuria followed the attack, lasting in one case for twelve hours, and in another for several days. Henoch ("Vorles.", S. 58) also records a case, of a four years old child, who developed uraemia, although the day before the urine, which was scanty, had been tested and found to be free from albumen. After the fit, the urine was drawn off by a catheter, and when examined was found to contain a considerable amount of albumen. The child recovered. In another case, that of a boy twelve years of age, in which uraemia occurred, the urine though scanty was free from albumen before the attack, after which it was drawn off with the catheter, and found to be albuminous, and to contain many highly granular casts. This case was fatal.

As a rule, uraemia occurs oftener in severe than in mild cases, though the latter are by no means exempt, and usually the symptoms do not appear until the nephritis has lasted for some time. The attack is usually preceded by a great diminution in the quantity of urine secreted, and its onset may be gradual or abrupt. In addition to the headache, vomiting, and muscular twitchings of the face and hands, there may be more or less deafness, tinnitus aurium, and in some cases, a greater or less degree of stupor. The pulse, as a rule, becomes slower and fuller, though its rate may be increased and its

tension lowered. The temperature usually rises several degrees, in severe cases frequently to 106°F., but in some cases it may be subnormal. The respirations are short and quick, and the tongue and skin are dry. If the attack be not warded off, convulsions now occur, and are at first of a tonic, then of a clonic nature; they may involve groups of muscles, or may be general. They vary in intensity from slight twitchings of the eyelids and the angles of the mouth, to a general involvement of the muscles of the entire body, or they may be confined to one or more groups of muscles, and may be one-sided or on both sides. When they are confined to one group of muscles, the patient, as a rule, is not completely unconscious; but when general he is completely so, with loss of the reflexes of the skin, the conjunctiva, and the iris.

In a typical attack, the body and extremities are at first rigid, the mouth is closed, the lips are open (rarely shut), the eyes are fixed, and the pupils usually dilated, more rarely contracted. The face is pale and shrunken, and the respirations cease. This tonic stage is followed by that of clonic convulsions; the patient is still unconscious, and the convulsions may involve the whole of the muscles of the body (they are rarely confined to groups of muscles). They last for a variable time, sometimes very short, only a few minutes, or perhaps thirty to forty minutes, or even longer, and then diminish in severity, a period of relaxation alternating with the contraction, and then they cease. The face is very congested, the eyeballs protrude, bloody froth collects at the mouth, the tongue is bitten, and the respirations, which vary in length at different times, are hurried and deep. The temperature may rise several degrees, but, as a rule, it is low or even subnormal, and the pulse becomes slow and irregular. The skin is covered with a copious perspiration, and the urine and faeces are passed involuntarily. When the attack ceases, the breathing becomes more regular, the cyanosis disappears, and consciousness returns gradually.

In some instances, there may be only one attack, and in this the patient may die, but more frequently the convulsions recur at longer or shorter intervals, and in these cases, when recovery is to take place, the attacks become less frequent, shorter, and not so general, whilst consciousness returns and lasts a longer time between each attack. In those cases, on the other hand, which end in death, the attacks increase in severity and frequency, the patient becomes comatose, and the urinary secretion is entirely suppressed, and death may take place either during a convulsion or during the comatose stage, the result of oedema of the lungs, or oedema of, or haemorrhage into, the brain.

When the patient recovers, various sequelae have been observed - e.g., aphasia, melancholic depression, disturbances of motion and sensation, mania, and amaurosis. The latter is the most frequent sequela, and, as a rule, lasts for only a very short period, if at all, after the convulsion has disappeared, though in many cases it has been known to last for weeks. It usually ends in recovery.

Wagner noted a case where there were eleven attacks in one day, and each attack was followed by the wildest mania. The temperature in the axilla rose to 107.6°F., and yet the patient recovered.

As a rule, albuminuric retinitis does not occur.

According to Leichtenstern (p.247), uraemic dyspnoea or tachypnoea, which is usually seen in combination with tachycardia, is one of the most frequent modes of onset of scarlatinal uraemia, and he also considers (Deut. med. Woch., 1882, S. 247) the uraemic symptoms to be due to anaemia, and to an inflammatory oedema of the brain and its membranes. In addition perhaps there may be peculiar auto-intoxications as well.

Mazaud (Rev. d. mal. de l'enfance, 1898, t.xvi) says that the toxicity of the urine is very high during the febrile stage of scarlet fever, and produces convulsions if injected into animals. As the fever

diminishes, there is a urotoxic crisis, which is of short duration, and usually coincides with the urinary crisis. When the patient is convalescent, the urine becomes, and remains, hypotoxic for a long time.

Cases and Charts.

Case 22. - Daisy Wilson, aged 4 years, admitted to hospital on October 11th, 1904. The initial symptoms - sore-throat and vomiting - began on October 8th, and the rash appeared next day. On admission the temperature was 102°F., pulse 130, respirations 36. She had a typical attack of scarlet fever, the urine, which was examined daily, was free from albumen. Desquamation was first noticed on the cheeks on the 16th. The illness ran an ordinary course until November 1st, when the temperature rose to 99°F., and the urine contained about one-third of albumen. The pulse was 115, and its tension was increased. In the evening the temperature came down to normal, and remained so during the remainder of the illness. There was puffiness of the lower eyelids, and the knuckles, and the dorsum of the feet were slightly oedematous. Next day (Nov. 2nd), the amount of urine was 28 ounces, and on the sixth it was 31, whilst the oedema, which had never increased, practically disappeared on the 7th. The amount of albumen was diminished to one-fourth on November 8th, and on the 22nd there was only a trace. The urine was free on December 19th, the child was allowed up on the 20th, and discharged on January 2nd, 1905. The urine was examined the day she left the hospital, and contained no albumen.

Case 23. - David Ellin, aged 5 years, admitted to hospital on June 11th, 1905. According to the history, the child had been attended by a doctor for cold since June 1st, and had been allowed to run about the house, and even out of doors. On the morning of June 11th, desquamation was noticed upon the hands, and he was sent into the hospital. On admission the child was very oedematous, the eyelids were nearly closed, and there was great oedema of the hands, arms, feet and legs. The urine contained a great amount of blood, and was very

dark in colour. It was almost solid when boiled. The bowels were constipated. According to the message received at the hospital, the case was an ordinary one of scarlet fever! The pulse was 128, and the tension was increased. Next day (June 12th), the urine amounted to 21 ounces, and the blood had almost disappeared. On the 13th, 18 ounces, and on the 14th, only 19 ounces of urine were passed; there was only a slight trace of blood, but the albumen was about three-fourths. The skin was acting freely under treatment. On the 16th, the blood increased, and from the 28th to July 2nd, it was so great in amount that the urine was of a bright red colour. After the latter date, it gradually decreased, and had disappeared on July 20th. The oedema of the legs and arms gradually disappeared, and was not apparent after the 20th, but the face was slightly swollen for 10 days longer. The albumen was diminished to about one-half on June 24th, and to one-quarter on July 5th, and there was only a faint trace on July 19th, whilst on the 22nd it had disappeared. He was allowed up on July 23rd, and the urine remained free from albumen until he was discharged on September 6th.

Case 24. - Amy Brown, aged 9 years, was first seen on the evening of June 1st, 1905. On the previous day she began with sore-throat and vomiting, and the rash appeared on the afternoon of the next day. When seen, the rash was noticed on the chest and arms; the temperature was 103.2°F., pulse 120, respirations 30. The urine contained no albumen, and the attack appeared to be mild. The parents refused to send her into the hospital. On the 5th the temperature was normal, and desquamation was noticed on the neck three days later. She was progressing favourably until the evening of June 18th, when I was urgently summoned to see her. I found her with a temperature of 104.8°F., pulse 136, and of high tension, and passing very little urine, which was bloody and loaded with albumen. Three days before, the urine on examination was found to be clear.

DISEASE.

Scarlet Fever.

Nephritis. Uraemia

Notes of Case.

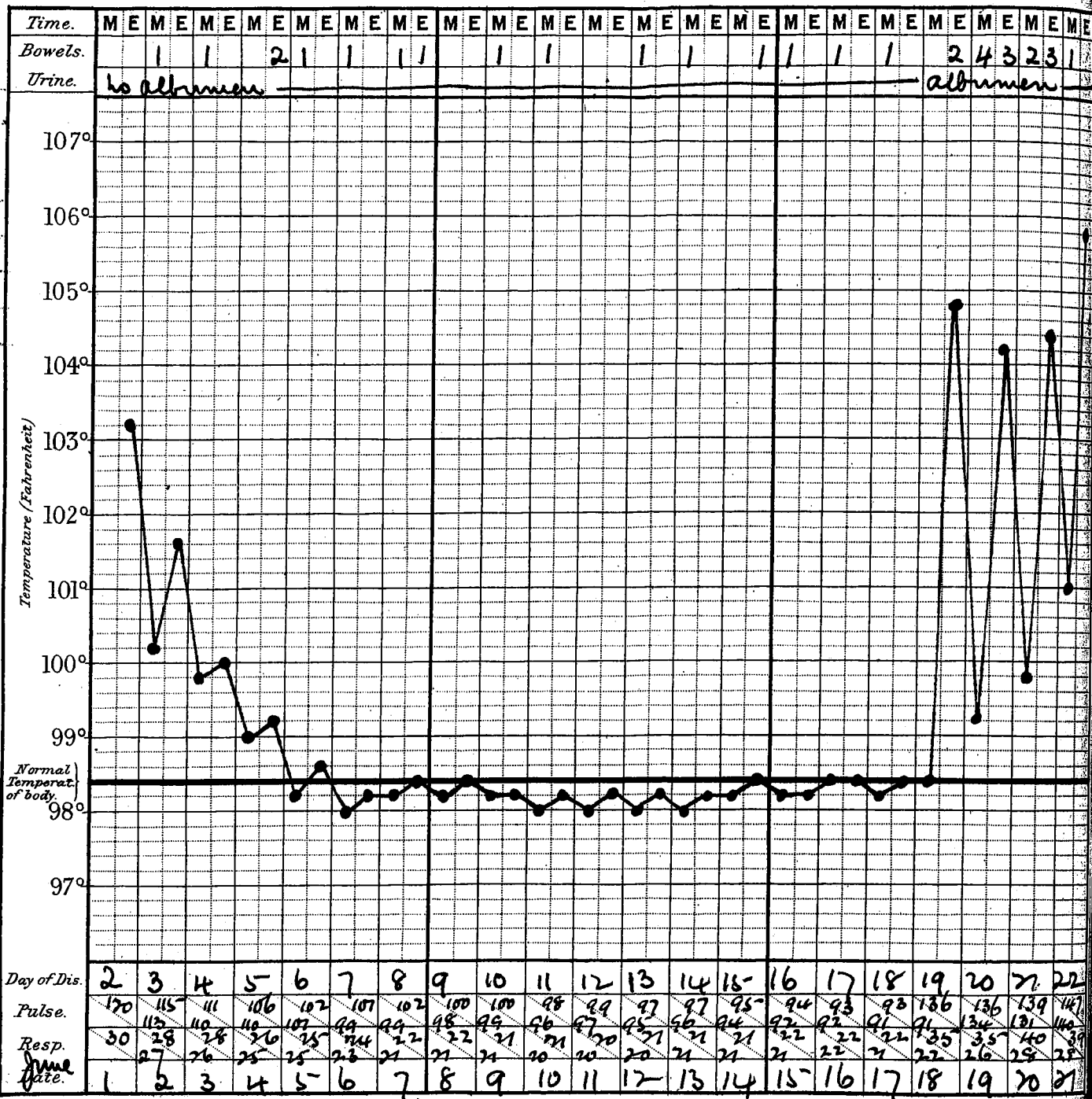
Name Amy Brown

Age 9 years.

Diet

Case Book No.

No. 24.



First seen on Note by Radcliffe Cross June 1st. 1905

Result Died June 21st. 1905

Entered at Stationer's Hall. *Printed and Published by Wodderspoon & Co. 6, Gate Street, Lincoln's Inn.* *Gould's Clinical Chart.*

The eyelids were puffy, and the hands and feet were oedematous. Next morning the temperature was 99.2°F., but in the evening rose to 104.2°F. She only passed about 10 ounces of urine. Slight twitchings were noticed in the muscles of the face. Next day the temperature was low in the morning, and high in the evening, and there was practically suppression of urine. During the day the twitchings were more noticeable, and during the night she had three convulsions. She appeared better on the morning of the 21st, and had passed a small quantity of urine into the bed, but during the afternoon the fits returned, and she died comatose at 2.15 a.m.

THE GASTRO-INTESTINAL TRACT.

In some cases we may see a more or less severe ulcerative stomatitis, which usually occurs in young children, at any rate, it is practically unknown to occur after puberty. According to Caiger, it appears in 1.96 per cent. of all cases, and is unaffected by sex, or by the season of the year. It may occur in the mildest forms of the disease, and in scarlatina anginosa it is frequently due to extension from the throat. It varies greatly in its severity, and is most common in strumous children, or in those who are ill-fed, and whose surroundings are unhealthy, and it is very apt to occur in those who have had or are suffering from measles.

In the mildest forms it begins as a sponginess of the gums, frequently around a carious tooth, followed by ulceration, and the surface readily bleeds on being touched. The disease spreads to the tongue, the cheeks, and the lips, and may stop short at a few shallow ulcers, in addition to the spongy gums. These ulcers have a grayish floor and angry margins, the tongue is moist, and covered with a brownish fur, there is salivation, foetid breath, and enlargement of the submaxillary glands. As a rule there is no rise of temperature, and the constitutional disturbance is only very slight.

In more severe cases, actual gangrene or noma results. The ulcers on the gums, lips, tongue, and cheek take on a fungating character, or may actually slough, the teeth loosen or fall out, there is much constitutional disturbance, the temperature is elevated, and the whole thickness of the cheek may be involved. These cases are rare, and may be cured by appropriate and energetic treatment. Even in the mild forms of the disease the patient is greatly debilitated; he is usually unable to take a sufficient amount of nourishment, owing to the painfulness of the affection.

It is apt to be complicated with diphtheria, and this may spread to the larynx with a fatal termination.

Vomiting is one of the most frequent of the initial symptoms of the disease; and, according to Litten, it is rarely so severe as to be dangerous in itself. In the malignant forms it is a very prominent and dangerous symptom; but in rare cases only can it be looked upon as due to the stomach itself, and caused by the disturbance taking place in it. Later in the course of the disease, it occurs with the development of nephritis, or with the onset of uraemic symptoms. Sometimes a cough appears, and owing to the abnormal condition of the pharynx may produce nausea or even vomiting.

Diarrhoea is very common in the period of invasion, and in the first part of the stage of ~~invasion~~ eruption. In some cases it may be so severe as to lead to great exhaustion, whilst, when it occurs during uraemia, it may be productive of much good. Litten (Charité-Annalen, Bd. 7, S. 128) has studied the conditions occurring in the intestine in scarlet fever, and has divided them into three groups - viz.:

1. Simple Catarrhal Enteritis. - This form, which usually runs a rapid and favourable course, is not due to any discoverable pathological influence, and may occur at any time of the disease. He also says that the course

of the disease may be very much lengthened, and the patient may become very prostrate, by the occurrence of obstinate diarrhoea. He records the result of two post-mortem examinations, - in one the intestinal mucous membrane was very oedematous, and, in the other, the large intestine was catarrhal, with slight follicular ulceration.

2. Dysentery. - In this form there is tenesmus, with blood and pus in the motions. Anatomically, he found, most frequently in the large intestine, diphtheritis with ulceration, which extended into the small intestine and the rectum.

3. Scarlatinal Typhoid. - In this form the stools are liquid, do not contain blood or pus, and are of a pale colour (bright yellow with white spots and specks). The abdomen is markedly tympanitic, the pulse very rapid, and of high tension, showing a marked contrast to the pulse of typhoid fever, and there is a great liability to severe and fatal haemorrhages from the bowel.

According to Litten, who has been corroborated by Thomas (p. 482), this form is very severe, and marked by typhoid-like symptoms; and when the patient survives, convalescence is apt to be very protracted. Anatomically, he found swelling of the solitary glands and Peyer's patches, and follicular erosion of the mucous membrane of the intestine. The spleen was enlarged, with swelling of its follicles, and the mesenteric glands were also enlarged and pulpy.

The peritoneum is more frequently involved in scarlatinal nephritis than in simple scarlet fever.

J.H.McCollom and J.B.Blake (Boston M. and S. Jour., Dec. 10, 1903) report two cases of peritonitis, which occurred late in the course of scarlet fever. They were due to a streptococcus, and were independent of any local exciting cause. Other serous cavities, part of the circulatory system, as well as organs of special sense,

and excretory organs were also involved. In both cases the scarlatinal attack was not very severe, and in one the onset of peritonitis was gradual and painless. In this case the temperature was found to show a rise during the period of convalescence, and it fluctuated for several days before the peritoneum was found to be affected. In the other case, the peritonitis developed suddenly, with pain and slight symptoms of intestinal obstruction. An operation was found to be necessary.

These observers had only seen 2 cases in a clinical experience of 8000 cases of scarlet fever.

THE LIVER.

Many epidemics are characterised by the occurrence of a mild form of jaundice, which is usually best marked when the eruption has faded. It usually disappears during the first part of the period of convalescence; and, whilst in the majority of cases it is mild, in others it may be associated with acute degenerative changes (acute yellow atrophy) in the liver, leading to a fatal termination. Baginsky ("Die Kinderkr".) Berlin, 1889, p. 117) says that when jaundice develops, either with or during an attack of nephritis, there is great danger of uraemia occurring.

In most cases of scarlet fever the liver is enlarged, and may be palpable, and this enlargement is usually most marked when the eruption is at its height. According to Litten, cloudy swelling of the liver cells is usually seen in every case at the post-mortem examination; and, in severe cases, this is followed by acute parenchymatous degeneration, which may cause destruction of the liver cells, and lead to acute yellow atrophy.

THE VEINS.

Of late years attention has been drawn to the occurrence of phlebitis in scarlet fever by Moizard and Ulmann ("La Phlebite scarlatineuse", Arch. de Méd. des

Enfants, Vol. 2, No. 10, 1899, p. 601). These authorities, in addition to recording a case of their own, also collected four others from different sources; and, although they were unable to say definitely that there was any relation between the severity of the infection and the occurrence of phlebitis, they thought, after a full consideration of the five cases, that it would be most likely to occur in those cases in which the affection was most marked. As a rule, it appeared between the fourth and fifteenth day of the illness.

In the case observed by them, the right axillary and humeral veins were affected, and bacteriologically they found that the phlebitis was due to streptococcic infection. In the cases collected by them, a branch of the right brachio-cephalic, the inferior vena cava, the jugular, the veins of Galen, and the right lateral sinus were affected.

Phlebitis may occur in the external jugular vein as the result of extension from suppurating glands near it, and of the consequent thrombus formation in the vein.

THE EYES.

As a rule, the eyes are rarely involved as a direct result of the scarlatinal poison in cases of simple scarlet fever in those who are of a healthy constitution; but, in the more severe forms of the disease, and in those who are delicate and cachectic, especially when living in poor and overcrowded districts, serious complications may occur, - leading to severe impairment of, or even destruction of, one or both organs. No affection of the conjunctiva may be thought to be so trifling as to be left unattended by appropriate treatment, for fear of some further complication ensuing. In some cases when the eruption appears upon the eyelids, minute excoriations sometimes occur, and these may be the starting point of conjunctivitis and blepharitis, especially occurring during the stage of desquamation. In delicate subjects the cornea may ultimately be

involved, leading to corneal ulceration and perforation, and perhaps iritis and choroiditis.

In the very severe forms of the disease, when the brain is affected and the faculties dulled, there is imperfect movements of the eyelids, together with diminution of the secretion of tears; consequently foreign bodies are not washed off from the cornea, and lodging there frequently set up keratitis, which may be followed by panophthalmitis and destruction of the eye.

Frequently, when the lesions in the throat are very severe, an extension occurs to the lachrymal gland and the lachrymal duct, which in turn infect the conjunctiva; and in those cases where the lesions are diphtheritic, croupous or diphtheritic conjunctivitis is also very apt to occur.

In septic cases we may notice cellulitis of the orbit, and septic processes in the retina; whilst in those cases complicated with nephritis, neuro-retinitis and uraemic amaurosis and amblyopia are apt to occur. In haemorrhagic cases we may note haemorrhage into the retina; whilst optic neuritis occurs when meningitis is present. When the throat lesions have assumed a true diphtheritic form, paralysis of the ocular muscles may occur.

THE NERVOUS SYSTEM.

Symptoms referable to the nervous system occur in almost every case of scarlet fever, and seem to be part of the disease; whilst, in the very severe forms, they must be looked upon as constituting very grave complications. In children the disease is frequently ushered in with one or more convulsions, following which we often notice more or less severe headache, langour, dulness or apathy, and delirium. The last symptom varies in different cases: in some it may be very mild, in others very severe and persistent, and accompanied by much restlessness, frequently leading, in the malignant forms of the disease, to coma and death. In the milder forms,

when the temperature falls, the delirium gradually disappears, and the patient falls into a sound refreshing sleep, and wakes up feeling much better. In the malignant forms, the cerebral symptoms are due partly to the scarlatinal poison, and partly to the high temperature.

According to Thomas (p. 275), symptoms referable to the central nervous system are the most frequent complications of scarlet fever, when the disease runs a severe course or shows serious complications. They may occur early in the disease, or only later on some complication arising.

In the septic forms of the disease we may notice foci of pus in the brain, due either to organisms in the circulating blood, or to infective emboli from the heart, the pulmonary veins, or from the mastoid process when diseased. Meningitis may also occur, though, according to some authorities, it is very rare. Henoch says he has had no personal experience of it, and thinks the clinical symptoms of meningitis cannot be distinguished from those that characterise the malignant form of the disease; whilst, according to v. Jürgensen, it cannot be differentiated from the symptoms of uraemia. Reimer (p. 17) found meningitis 17 times in 48 post-mortem examinations of persons dead from scarlet fever, and tubercular meningitis once.

Sometimes in those cases complicated by nephritis and uraemia, in addition to the ocular symptoms such as amaurosis and retinitis, we may notice aphasia or hemiplegia, - symptoms rather more referable to the renal condition than to any action of the scarlatinal poison. These symptoms in favourable cases disappear.

S. N. Cherepin (Prakt. Vrach., 1903, No. 34) saw a severe case of scarlet fever complicated by aphasia with paresis of the right arm and leg, lasting seven days. Consciousness was fully maintained.

In rare cases mania (post-febrile) may occur.

THE INTEGUMENTARY SYSTEM.

Many changes are seen in the skin during scarlet fever, of which the most common in eczema; in fact, this disease occurs more prequently in scarlet fever than in any other of the infectious diseases. It is usually seen around the nostrils, the upper lip, and in the region of the ears, where it is the result of the irritating discharges. According to Caiger, its frequency is 2.11 per cent, in 4015 cases. It may also be seen on the scalp and on the face. About the ears it is usually noticed around the external auditory meatus, at the junction of the ear with the side of the head, and within the groove of the helix. It is more common in winter than in summer, and in younger children than in adults. It seems to be more frequent in those who are on a liberal meat diet, and in those whose faces have been chapped from exposure to the weather. As a rule, it appears in the impetiginous form, which is aggravated by picking, and is readily inoculable on other parts of the body. In some cases it is accompanied by a ringworm of the scalp.

Herpes occurs in mild as well as in severe cases, and is usually seen around the mouth. Boils and multiple abscesses may also occur, especially in the debilitated, and in septic cases; but erysipelas is rare.

Urticaria has also been noticed, and sometimes pemphigus occurs along with the eruption, either in sporadic cases or in epidemic form, and also during the stage of desquamation (Thomas in v. Ziemssen's Handbuch, pp. 292-305).

In the more severe cases, and especially in those with septic throats, bed-sores are apt to form on those parts of the body most exposed to pressure, and gangrene, either of the skin or of the genitals, or of the extremities, may occur. When attacking the genitals, the patients are usually ill-fed and cachectic. Eichhorst (Deut. Arch. f. klin. Med, Bd. 70, 5-6) reports three cases of gangrene after scarlet fever, in all of which

the legs were affected. Von Jürgensen also reports a case, in which the legs and arms were affected, the result of an embolism. Wilson (Arch. f. Kinderh., 1898, xxiv, p. 418) records a case of symmetrical gangrene which extended from the nose upon the rest of the face. The same occurred over the sacro-coccygeal region. It developed about three weeks after recovery from scarlet fever.

In some cases the desquamation may be so excessive as to involve the deeper layers of the skin, leaving raw and excoriated surfaces.

In many cases vaginitis may occur.

Secondary Rashes. - These appear after the disappearance of the primary and characteristic rash, and must not be mistaken for relapses. They are fairly common, and although usually appearing during the second or third weeks of the disease, may be noticed at a much later period. The most common form is a papular eruption, which is seen first upon the buttocks and the extensor surface of the legs and arms. These papules are of a pale red colour, frequently firm to the touch, and in a few days many more appear on the extremities, favouring the extensor rather than the flexor aspects; whilst occasionally they may also occur upon the trunk and face. They last for one to several days, and are usually discrete at first, though after a time they may run together and form blotches. On the face they look very much like measles.

Occasionally we notice a bright scarlatiniform erythema, which usually appears upon the chest, abdomen, back, and extremities. It can be differentiated from the true scarlatinal rash of a relapse by the absence of sore-throat, and no elevation of temperature.

Sometimes secondary rashes are seen in those cases showing septic throats, whilst in nephritis, they also frequently occur.

RELAPSES.

In some cases a true relapse or secondary attack of the disease occurs before the patient has finished desquamation as the result of the primary attack. It may occur any time after the middle of the second week of the disease, most usually, according to Thomas (v. Ziemssen's "Handbuch", p. 295), during the second or third week. Koerner has collected 39 cases, and he says whilst no age is exempt, relapses are more frequent between the ages of 7 and 14 years. As a rule, they are not very common; Caiger says .7 per cent. in 12,000 cases; and they have usually been noted in hospital patients, in whom they are due to a reinfection, owing to the air of the wards being constantly infected by the admission of new cases. The attack is usually of a mild character, though it has been known to be severe and cause death, and the fever, sore-throat, and rash are all present, followed by desquamation. The glands under the jaw are enlarged, and the tongue is typical. According to Thomas (p.198), the course of the temperature is not characteristic, and the rash invades the face, the vicinity of the mouth being involved. He also states that slight conjunctivitis, nasal and bronchial catarrh, have been noted before the appearance of the second eruption.

Case and Chart.

Case 25. - Arthur Payne, aged 10 years, admitted to hospital on December 10th, 1904. The illness began on December 6th with vomiting and sore-throat, and the rash appeared on the 7th. On admission the temperature was 100°F., pulse 98, respirations 24. The rash was hardly perceptible, the tongue was the typical red strawberry, the throat was only slightly injected, and the glands under the jaw were only slightly enlarged. The urine contained a trace of albumen. Desquamation was noticed on the cheeks on the 11th, and the disease ran a favourable course until December 29th, when the patient complained of sore-throat, and the temperature rose to 101°F. in the evening. Next day a typical scarlatinal

rash was seen on the trunk and extremities, the glands under the jaw increased in size, and the tongue was typical. The disease ran the usual course, and the rash had disappeared on January 3rd, 1905; and three days later desquamation was again noticed on the neck. There were no complications, and he was discharged from the hospital on February 17th, 1905.

SEQUELAE.

Owing to the fact that scarlet fever manifests itself in such varying degrees of intensity, and that it may be complicated by changes occurring in nearly every organ of the body, it necessarily follows that it is liable to be followed by sequelae, not only exceedingly numerous, but showing great variation in their severity.

When a patient has had an attack of scarlet fever, and espècially when it has been severe, and the patient of delicate constitution, an anaemic condition may be left, which lasts for a longer or shorter period. During this time, and we occasionally see it even after an ordinary attack, the patient is very liable to contract other infectious diseases, and very frequently he may become markedly cachectic. According to Barthez and Rilliet (p. 201), scarlet fever and the tubercular diathesis are antagonistic.

They say:

1. Scarlatina, in rare instances, favours a development of tuberculosis.

2. Tubercular children rarely take scarlet fever, which then runs an anomalous course.

3. Children with a tuberculosis that has been cured may contract scarlet fever, and the latter disease may in such cases follow a normal course.

4. Tubercular children who contract scarlet fever are found to have only a few crude tubercles, which are rarely caseous.

5. In such cases the tubercles tend to calcify within a short time.

Mayr (Hebra's Handbuch, p. 141) contradicts these statements; and other observers say that when a focus of tuberculosis is present in the body, an attack of scarlet fever may set it into activity. Von Jürgensen also disagrees with Barthez and Rilliet; and Leichtenstern saw two cases of miliary tuberculosis during the convalescence from scarlet fever. There is no doubt we may observe tubercular disease of the lungs, or of the lymphatic glands, or of the bones, or joints, and occasionally of the meninges, but, as a rule, the predisposition to this disease is much greater in measles than in scarlet fever.

According to Forcheimer (20th Cent. Prac. Med., 1898, Vol. 14, p. 80), ozaena may persist throughout life, in spite of the most careful attention and local treatment, as the result of the streptococcic infection of the nose. The teeth may be affected, showing great friability, lack of enamel, and a tendency to early decay; the tonsils may be chronically enlarged, and the mucous membrane of the pharynx and nose show chronic inflammatory changes. As a result of ulceration we may see a perforation of, or loss of, part of the soft palate, perforation of the palatal arches; and when true diphtheria has occurred as a complication, paralysis of the soft palate, or of the muscles of the eyeball may occur. In the neck we may see torticollis, either as the result of cellulitis of the connective tissue, or more rarely as a result of inflammatory changes in the vertebrae of the neck. As the result of changes in the middle ear, there may be partial or total deafness in one or both ears, and this is unfortunately one of the most common sequels to the disease; whilst perforation of the tympanum, chronic otorrhoea, caries of the petrous portion of the temporal bone, involvement of the mastoid process, paralysis of the facial nerve (which is usually permanent), are all liable to occur.

Frequently the lymphatic glands may remain enlarged for a considerable period of time; whilst, as a result of the changes in the joints, more especially when

the process has been of a pyaemic nature, varying degrees of stiffness and deformity are apt to remain.

Although, as a rule, the nephritis complicating scarlet fever tends to complete recovery, cases occur where there is a persistence of the albuminuria (see p.162). Usually the urine clears up in about four to six weeks, but even so late as three months albumen and casts have been found, and accompanied by oedema of the face.

The principal sequelae in the skin are furunculosis, and other chronic eruptions, such as erythema, which has been known to occur at certain periods of the year, and to be followed by desquamation. Sometimes a delayed, or even a secondary, desquamation may be noticed.

In some cases endocarditis, usually affecting the mitral valves, results, though, according to some authorities, this may not be seen for some little time afterwards, as it is due to an extension from the mural endocardium to the valvular segments.

With regard to the sequelae of the central nervous system, we have it on the authority of Putnam, that spinal affections and multiple neuritis are rare, but chorea is frequently noted; and whilst Gubler and Bouchut and also Gerhardt (Lehrb. der Kinderkr., S. 76) regard it as a frequent sequela, Henoch ("Vorlesungen", p. 659) says he has only seen it during the disease, and never as a sequel. According to Moore ("Eruptive and Continued Fevers", p. 171), chorea may develop from two to six months after the scarlatinal attack; and Priestley (Brit. Med. Jour., Sept., 1897, p. 805) found it as a sequel in 13 cases out of 5355 - i.e., 1 in 412. In the Report of the Collective Investigation Committee (Brit. Med. Jour., Vol. 1, 1887, p. 425) scarlet fever was found to be the cause of chorea in 6 per cent. of all cases; and Carslaw (See Osler, on "Chorea and Choreiform Affections", p.17) saw it in 3 cases out of 553.

According to Fürbringer ("Scarlatina", in Eulenberg's "Real-Encyclopaedie", Vol. 17, 1899, p. 478), scarlet fever is apt to be followed by a peculiar focal haemorrhagic encephalitis, which is usually accompanied by nephritis. He attributes this as the cause of death in a child who, in the sixth week of the disease, became hemiplegic, and died in a few days; and to this also von Jürgensen attributed peculiar atheto-choreic movements in a paralysed arm lasting over ten years. Henoch agrees with Fürbringer as to the occurrence of this focal haemorrhagic encephalitis, and states that he has seen aphasia, which lasted almost a year. Wildermuth has noted chronic epileptic conditions; and sometimes, though rarely, the meninges and the brain may be involved as a result of extension of the process in the middle ear; whilst optic neuritis, and hysteria, have been noted.

Lastly, acute psychosis may appear during convalescence; and, according to Kraepelin ("Ueber den Einfluss acuter Krankh. auf die Entstehung von Geisteskrankh.", Arch. f. Psychiatrie u. Nervenkrankh., Bd. 12, S. 84), it usually begins during the process of desquamation, between the ninth and eleventh days of the disease. There is "marked excitement, anxious confused delirium, and varying melancholia, more rarely exalted, illusions and hallucinations of one or of all the senses, most frequently that of sight". He considers that exhaustion plays an important part, but individual predisposition has a great influence, and was noted in 38 per cent. of all the reported cases. It usually occurs in early life, and in males oftener than females, - in the proportion of 3 to 1. The prognosis is good, some cases may recover in a few hours, 75 per cent. in a week, and the remainder at different times within a month.

Leichtenstern (p. 175) records a case in which chronic oedema of the glottis occurred, in a patient towards the end of the stage of convalescence, and in which threatened suffication had to be prevented by incisions.

Sometimes complete paralysis of the muscles of the larynx may be observed, and is due to an infiltration of the muscles by fluid. In these cases there is loss of voice and laryngeal dyspnoea.

Tetany and traumatic tetanus have been reported by Fürbringer (p. 478) to follow surgical scarlet fever.

DIAGNOSIS.

(A). GENERAL DIAGNOSIS.

No other disease causes more anxiety in arriving at an accurate diagnosis than scarlet fever, as it is of the greatest importance, not only for the sake of the patient, but also for the community at large, that the physician should come to a definite conclusion at the earliest possible moment. When the patient suffers from a typical attack of the disease, its recognition presents no difficulty, especially if it be epidemic in the district at the time, and even in those cases where all the cardinal symptoms are not present, the diagnosis should not long remain in doubt, if we can obtain a history of exposure to the infection; but we frequently meet with cases in which it is extremely difficult to be certain of our diagnosis in less than two or three days, or, at any rate, until the latter phenomena appear. We have to wait for the appearance of the characteristic symptoms - e.g., desquamation, or some complication - nephritis, adenitis; and at times the diagnosis may only be proved to be correct when other cases arise from it, - these latter showing a typical period of incubation, followed by the well-known symptoms.

When all the cardinal symptoms are present, its recognition is not a difficult matter, and although many acute diseases may resemble it, the diagnosis should not long remain in doubt, if all the symptoms are thoroughly considered, especially if careful attention be given to the history of the attack. Even in typical cases we may be in doubt until some days have elapsed, and it will be best in all cases when a suspicion of scarlet fever exists, to consider it and treat it as such, for if the diagnosis ultimately prove to be wrong, no harm will have been done, - whereas if the case had not been isolated, and proved to be scarlet fever, grave results may follow, not only to

the patient, but to those with whom he had been in contact. It is, of course, a serious matter if a patient is sent to an isolation hospital owing to an error in diagnosis, for then he is liable to become infected after he enters the building, and I have known at least four cases, which have been sent into the Swallownest Hospital as scarlet fever, who have been free from the disease. In large hospitals where a physician is in residence, these doubtful cases would be sent to the isolation wards, but in smaller institutions possessing no resident staff, they would of course, be sent direct to the scarlatinal pavilion. German measles, and the so-called "fourth disease", are those most liable to be mistaken for scarlet fever, and surgical and puerperal scarlatina often present great difficulty in diagnosis.

When we first see a patient in the early stage of the disease, it may be impossible to make a diagnosis, and we are compelled to wait until the appearance of the exanthem, although, at the same time, we may have been suspicious of its nature.

On September 10th, 1905, I saw a boy of 9 years of age, who had been taken suddenly ill on the evening previously, with sore-throat, vomiting, and aching pains in the limbs. The temperature was 103°F., pulse 119, the throat was very red and swollen, and the tongue was covered with a whitish fur. The throat did not show a punctate appearance, and there was no exanthem; but I suspected scarlet fever (although there had been no case in the district for over a year), and I ordered him to be kept in a room by himself. Next morning I found the typical scarlatinal rash, and he was removed to the hospital the same day.

The mild cases often cause the most anxiety, for in these the appearance of the throat may not be distinguishable from that seen in an ordinary catarrhal sore-throat, whilst the rash may only be imperfectly developed, or perhaps absent. In cases such as these, we may be able to elicit a history of exposure to the

scarlatinal infection, or we may be aware of the presence of the disease in an epidemic form in the district. Again, we may be informed that the attack commenced quite suddenly with vomiting, and after waiting for a day or two, the tongue may develop the typical strawberry appearance; or, on the other hand, we may not be able to find any clue until the appearance of the desquamation, or the occurrence of nephritis, adenitis, etc.

Cases in which the pharynx is markedly involved very early in the attack, and when the rash is wholly absent, or is poorly defined, irregular in distribution, and transient in character, the diagnosis may present the greatest difficulty; and in the malignant form of the disease, where death occurs before the appearance of the exanthem, we may be unable to make a diagnosis; in fact, it can only be positively made if we are able to obtain a history of the occurrence of other cases of scarlet fever in the district, or if we can find that the patient has been exposed to the infection, or that a member of the same family subsequently develops typical scarlet fever. Pye-Smith (Fagge's "Principles and Pract. of Med.", 3rd Edn., Vol. 1, p. 189) mentions such a case. He says: "The writer saw a little boy with Dr. Andrews in 1883, who was taken ill the same morning with severe headache, vomiting, and prostration. When seen he was already comatose, but there was no exanthem. The temperature was 105.6°F., the skin was pungently hot, and the pulse too rapid to be counted. Such a condition could only be due to smallpox or scarlatina, and the presence of good vaccination marks, together with the characters of the skin and pulse, justified the latter diagnosis. He died the same afternoon; and the nature of the case was confirmed by the child's nurse afterwards sickening of scarlet fever".

In making a diagnosis of scarlet fever we must consider all the symptoms, and not only rely upon the rash alone; and in all cases presenting any doubt it is absolutely necessary to refuse to give any positive opinion until the disease has declared itself. Mayr (loc.

cit., pp. 146, 219), whilst calling attention to the necessity for considering the general phenomena in order to form a diagnosis, also says: "The diagnostic signs of scarlatina are these: the existence of a special efflorescence; its mode of distribution over the cutaneous surface; the inflamed state of the parts concerned in deglutition; the peculiar desquamation; the spreading of the disease by contagion; its epidemic occurrence; the febrile symptoms which accompany it; and, lastly, the sequelae to which it gives rise".

The salient point which one should rely upon in making a diagnosis of scarlet fever are as follows:

1. The onset is very sudden; the symptoms of the stage of invasion are very serious, and show a rapid development; the temperature quickly attains a considerable height; the pulse is quickened, more in proportion than the temperature would suggest; vomiting is a very common symptom, and may be persistent; there is well-marked constitutional depression; convulsions sometimes occur, and the patient suffers from headache, many cases showing more or less stupor.

2. Well-marked sore-throat; the patient complains of severe pain, associated with great difficulty in swallowing, and on examination, the throat is seen to be swollen, and the mucous membrane of the pharynx is reddened, and shows the typical punctate enanthem. In some cases, at a later stage, we may see more or less formation of membrane, ulceration, etc.

3. The condition of the tongue; first the white, afterwards the red strawberry tongue.

4. The exanthem; this spreads from above downwards, and is usually first noticed under the clavicles, afterwards spreading on to the neck, trunk, and extremities. In many cases the face is also involved, and when this is so, the pallor of the circumoral region cannot fail to command attention. Particular attention must be paid to the punctate appearance of the exanthem, the puncta being slightly raised above the surface of the skin.

5. Enlargement of the lymphatic glands, especially of those in the inguinal regions, whereas enlargement of those in the neck is not so significant.

6. General desquamation of the skin, usually in shreds rather than in scales, and showing the pin-hole appearance. The desquamation is from above downwards, usually commencing upon the face, ears, and lips.

It will be most convenient to review the symptoms in detail:

The stage of incubation is usually devoid of any symptoms, at any rate, if any should be present, they cannot be considered as characteristic.

The stage of invasion commences abruptly; and this sudden onset, with its accompanying vomiting, sore-throat, headache, and general constitutional disturbance, is extremely suggestive of scarlet fever.

The Sore-throat. - This symptom is present, to a greater or less extent, in all cases of scarlet fever, with the exception of that variety known as scarlatina sine angina; and in a typical case is characteristic, though in some it may very closely resemble the condition seen in follicular tonsillitis, and until the exanthem appears, may be diagnosed as such. The fauces may be only slightly affected, presenting a pale, diffuse, mottled, congestion of the soft palate, uvula, and the faucial arches, whilst in more severe cases, the redness may assume a dusky tint, with much swelling, and the tonsils will be found to be enlarged, with plugs of secretion of a whitish colour, filling their crypts. The enanthem, as a rule, develops within the first twenty-four hours, and shows a typical punctate appearance. Usually the severity of the throat affection is in proportion to the amount of exanthem.

Windle (Clin. Jour., May 18, 1904) discusses the faucial affection in scarlet fever, and considers it to be quite diagnostic of the disease. He states that the eruption of scarlet fever occurs on the fauces, and not only presents the same characteristics, but also shows the

same changes as it does in the skin. He considers it to be the first manifestation of the rash, and as it occurs twenty-four, thirty-six, or even forty-eight hours before it appears on the skin, he lays special stress upon that fact as a diagnostic point. His experience leads him to the conclusion that sore-throat is the first objective symptom of scarlet fever, and that these throat symptoms, which are invariably present at the commencement of the general symptoms are characteristic, constant, and of early onset, and hence it is quite easy, in the majority of cases at any rate, to recognise an illness as scarlet fever on the first occurrence of the symptoms. He also states that, even in the earliest stage, some local changes may be seen in the fauces, if any given case be scarlet fever. According to him, the condition of the throat is as follows:

"In its earliest phase this faucial eruption consists of minute, bright red, discrete, slightly conical spots, each of which is surrounded by a ring of erythema. They are best seen on the pillars of the fauces, uvula, soft palate, and on the posterior part of the hard; for here the mucous membrane is paler than that of the rest of the mouth, and the eruption is not obscured by the presence of local inflammatory changes. The rash occurs on the posterior wall of the pharynx, the tongue, and occasionally extends forwards on to the buccal mucous membrane. In the mildest cases the punctated character of the eruption is maintained throughout. As a rule, however, in cases of ordinary severity, by the time the rash appears on the skin the punctate character has given place to an intense general 'sealing wax' redness of all the parts at the back of the mouth."

He also maintains that the condition of the throat in scarlet fever, even in the early stage, is characteristic, and so much so that it cannot be mistaken for diphtheria.

These statements cannot be said to agree with the opinions of most observers, as it is often exceedingly difficult to be absolutely certain of the

diagnosis of scarlet fever for two or three days, or perhaps not until the later characteristic symptoms appear, and frequently one sees cases of scarlet fever with only very slight, or perhaps no faucial affection at all.

The temperature of scarlet fever is not characteristic; it rises quickly at the beginning of the illness, and continues high, though with slight daily variations, until the rash begins to fade, - i.e., towards the end of the first week, when it falls by lysis.

The pulse usually is very rapid, this rapidity being out of all proportion to the height of the temperature. In many cases this disproportion persists for some little time after the temperature has fallen to normal.

Vomiting, which is a very common symptom, may occur at the commencement of other acute diseases, such as smallpox, pneumonia, etc. According to Von Leube (loc. cit., p. 414), it is of the greatest aid to diagnosis, as in children it occurs oftener in scarlet fever than in any other disease with the exception of pneumonia. The latter disease should not cause much difficulty in diagnosis, even if sore-throat be present, for if any doubt exists, waiting for a day or two will make the case clear, as none of the scarlatinal symptoms will appear. (For the differential diagnosis from smallpox see later). In diseases of the brain and meninges, vomiting is sometimes a distressing symptom, but a mistake can hardly be made if the case be thoroughly watched, for in cerebral affections there will be intolerance of light (photophobia), spasms of different muscles - e.g., squint, retracted abdomen, etc., whilst the vomiting will be of the cerebral type - i.e., the contents of the stomach seem to regurgitate without retching or effort. Vomiting due to brain mischief is not very common at the age of the greatest susceptibility to scarlet fever, excepting in cases in which there could hardly be any confusion of symptoms.

Convulsions may occur in children as a result of reflex disturbances, and may also be one of the first symptoms of pneumonia, measles, diphtheria, poliomyelitis, encephalitis, and acute cerebro-spinal meningitis. In these cases a diagnosis cannot be made until sufficient time has elapsed for the characteristic symptoms to develop.

The tongue. ✝ Many cases never show the typical changes in the condition of the tongue, but in the majority they are usually well-marked, and appear from the third to the sixth day, - occasionally they may be noticed earlier. When associated with other constitutional symptoms, they may be considered as characteristic. According to McCollom, the enlargement of the papillae at the tip and edges of the tongue is sufficient to base a diagnosis on in the absence of erythema or rash. In some forms of chronic glossitis, we may see a somewhat similar condition, but the absence of all the other symptoms of scarlet fever enable us to come to a correct conclusion.

The exanthem usually appears at the end of the first twenty-four hours. When the initial symptoms are well-marked, the appearance of the exanthem will make the diagnosis complete, but if any, or all, of those symptoms are absent, and if the rash be imperfectly or irregularly developed, great confusion is bound to exist. Those cases of scarlet fever showing a patchy rash of irregular distribution, and especially when it is of the confluent roseolar type (a rare occurrence), may be confused with measles, but if we wait a few days, the difficulty will disappear.

Again, if we are called to see a patient in whom the general symptoms are slight, and who, at the same time, presents a rash of a scarlatinal type, a great amount of uncertainty is sure to occur. According to McCollom, "The appearance of a punctate eruption in the axillae and groins, with congestion of the tonsils, and

a punctate eruption on the roof of the mouth, no matter whether there is any eruption anywhere else or not, are positive proofs of scarlet fever".

When we are called upon to make a diagnosis after the eruption has changed or faded, particular attention must be paid to the history of the case. Enquiry should be made as to the nature of any outbreak which may have been prevalent inthe locality, and we should ascertain if the patient has or has not recently been exposed to the infection of scarlet fever. We should note the mode of onset of the attack, whether sudden or gradual, and particular enquiry should be made for sore-throat, vomiting, and rash, and we must look very carefully for any evidence of desquamation. A point of great significance, as showing the commencement of desquamation, is the occurrence of a whitish line at the root of the nail (i.e., at the junction of the finger with the nail). In some instances we may notice the presence of one or other of the recognised complications - e.g., nephritis, adenitis, etc.

If the patient be seen for the first time in the early part of the convalescent stage, the tongue may show the typical strawberry condition, and it is of importance to remember that this condition may be present, to a greater or less extent, for about a week after the tongue has completely peeled, but the central part may again become coated towards the end of this period. In those cases where there has been a coarse and papular rash on the outer sides of the legs, although the eruption has completely disappeared from other parts of the body, it may still be seen on the legs for at least a week after its disappearance from the trunk, and here there may remain a slight staining for several days after a well-developed eruption has disappeared. Sometimes we may notice a fulness, or even enlargement, of the glands beneath the jaw, denoting a previous inflammatory condition of the fauces, and this fulness may remain for several days.

The enlargement of the lymphatic glands as an aid to diagnosis has been insisted upon by von Jürgensen and J.F.Schamberg. In ordinary cases, in the first few days the enlargement of the glands may not be of much diagnostic value, but perhaps in a doubtful case they might be of some help. Von Jürgensen (loc. cit., p. 222) attaches great importance to the enlargement of the inguinal glands in scarlet fever as a diagnostic aid, and Jay F. Schamberg (Ann. of Gyn. and Ped., Vol. 13, Sept., 1900, pp. 191-196) says:

"As a diagnostic aid, therefore, in differentiating the rashes in diphtheria from true scarlet fever, the study of the glands is perhaps of considerable value. A well-marked enlargement of all the superficial glands, particularly the epitrochlear and axillary, would in doubtful cases, I think, tend to throw the balance in favour of scarlet fever.

"In distinguishing between scarlet fever and measles, which task is not invariably easy, an examination of the glands lends but little aid, because in the latter disease there is also a generalised glandular enlargement. It is to be noted, however, that the adenopathy of measles is not nearly as well marked as that observed in scarlet fever".

According to Cabot, an examination of the blood shows a moderate amount of anaemia, and leucocytosis, which begins before the appearance of the eruption, and lasts until the stage of convalescence. Eosinophiles are said to be absent in bad, but increased in favourable cases, although this point, which is of great importance as to prognosis, has not been thoroughly corroborated.

Heim (Hufeland's Jour., 1812, Part 4, S. 75,76) mentions several cases in which certain members of the laity were able to diagnose scarlet fever by the odour of the patient. This odour is said to be somewhat similar to that of carnivorous wild animals when kept in cages.

Bertram Thornton (Lancet, June 18, 1904.) relates an anomalous outbreak of scarlet fever which came under his notice as Medical Officer of Health for Margate. It appears this epidemic occurred in a boarding school of 300 children, and the cases could be divided into three groups - viz.:

1. Typical cases, which showed a rash, sore-throat, and elevation of temperature (in most instances it was not more than one or two degrees): these cases numbered 31.

2. Cases showing no rash, but only slight redness of the tonsils, and an elevation of temperature (usually one or two degrees). These cases were all isolated on suspicion, and characteristic desquamation began during the second or third week of the illness. These cases numbered 19.

3. Cases showing desquamation only. These were examined daily, but showed not the slightest sign of illness. There were 46 cases.

A large number of cases from classes 2 and 3 were sent to the local isolation hospital, and none of them developed the disease there.

Tables showing the chief Points in the Differential Diagnosis of Scarlet Fever, Measles, German Measles, and the " Fourth Disease."

SCARLET FEVER.

Stage of Incubation. - Short - 1 to 7 days - usually 3 or 4 (2-5 Corlett).

Stage of Invasion & Prodromata. - Duration 24 hours, may be less. Sudden onset, patient feels very ill, sore-throat, headache, high temperature, rapid pulse, vomiting, convulsions (in some cases). Enlargement and tenderness (on palpation) of the submaxillary glands. In mild cases the patient may only complain of sore-throat, headache, and malaise.

Enanthem. - Appears on the first, or early on the second day as a diffuse punctate reddening on the hard and soft palate, uvula, inner surface of the cheeks, and posterior pillars of the fauces. The tonsils are red and swollen. Tongue coated, frequently showing prominent and injected papillae - the strawberry tongue.

Stage of Eruption. - Appears towards the end of the first, or at the beginning of the second day. First seen under the clavicles, and on the chest, and is of a well-marked scarlet colour - boiled lobster. It is punctate - (goose-skin appearance), and diffuse. It spreads from above downwards, and covers the whole body in 24 hours or less, and remains for 3, 4, or 5 days. When present on the face it avoids the region of the mouth and nose.

Temperature. - Continues high until the rash begins to fade (i.e., 3, 4, or 5 days).

General Symptoms. - The symptoms increase in severity during the development of the rash, the gastro-intestinal symptoms - e.g., vomiting, usually disappear. The temperature is high, and the pulse is very quick, the latter out of all proportion to the former. The glands of the neck and throat are usually palpable after the first few days.

Desquamation. - Begins towards the end of the first week, and lasts for 4 to 6 weeks, sometimes longer. It occurs in pieces or shreds rather than scales, and shows pin-hole appearance.

Complications and Sequelae. - Albuminuria is frequently present, and nephritis, otitis, rheumatism, and adenitis are very liable to occur.

MEASLES. - RUBEOLA.

Stage of Incubation. - 11 to 14 days - usually 11.

Stage of Invasion & Prodromata. - Duration 3 days.

Symptoms. - Coughing (dry), sneezing, lachrymation, photophobia, vomiting rare. Temperature falls on the second or third day.

Enantham. - Mucous membrane of the mouth as well as of the tongue is of a bluish colour (often seen on the first day), and this becomes more marked as the period of invasion develops. Koplik's spots are seen at the end of the second, or early on the third day. They develop as papules on the hard and soft palate, and inner surface of the cheeks, and on anterior pillars of the fauces.

These papules are of a reddish colour, sharply-defined, slightly elevated, and about the size of a pin-heador split-pea, with bluish-white dots in the centre.

Stage of Eruption. - The rash appears on the face on the fourth day, and consist of dark red or bluish-red macules, with a tendency to a crescentic arrangement. The papules are slightly elevated and have a serrated margin.

Temperature. - Falls on the second or third day; increases with the appearance of the exanthem, and falls when the eruption has matured.

General Symptoms. - The symptoms referable to the respiratory tract remain or increase in severity when the eruption appears.

Desquamation. - Begins about the fourth, or fifth day, and lasts about 10 or 14 days. Is branny, and often overlooked.

Complications and Sequelae. - Bronchitis, broncho-pneumonia, tubercular disease of the lung, otitis media, and naso-pharyngeal catarrh.

GERMAN MEASLES - RUBELLA - RÖTHELN.

Stage of Incubation. - Very variable, - from 5 to 21 days, usually 14 to 18.

Stage of Invasion & Prodromata. - Duration 1 to 2 days. Frequently absent; if present, usually mild. Slight catarrhal symptoms, watering of the eyes, sore-throat, well-marked enlargement of concatenate glands (post-cervical) The conjunctivae are pink-red, and suffused; vomiting.

Enanthem. - A slight enanthem appears on the soft palate, is macular, and lasts only for a few hours.

Stage of Eruption. - Rash appears first on face, spreads rapidly, and may cover the whole body in 24 hours, or may fade on one part of the body before it appears on the legs. Spreads from above downwards, and, as a rule, lasts 3 or 4 days (may be less), and consists of small, pale, rose-coloured spots, slightly elevated. The rash is discrete, and not arranged in groups, and may resemble either measles or scarlet fever.

Temperature. - Is, as a rule, only slightly increased, if at all, and is not characteristic. Pulse is in same ratio as temperature. The latter in some cases may be 103° or 104°F. (rare).

General Symptoms. - Usually none, or only very mild.

Desquamation. - As a rule, is absent; if present is slight, and branny, but never pin-hole.

Complications & Sequelae. - None. Albuminuria is exceedingly rare.

"FOURTH DISEASE".

Stage of Incubation. - Much longer than scarlet fever - 9 to 21 days.

Stage of Invasion & Prodromata. - As a rule, no symptoms; may have slight sore-throat. In this case the fauces will be swollen and reddish.

Stage of Eruption. - Diffuse bright, rosy-red, rash, slightly elevated, and covers the body in a few hours.

Constitutional Symptoms. - None.

Temperature. - As a rule, is low, even if copious rash. May be 103° - 104°F. Pulse is in same ratio as the temperature.

Desquamation. - May be copious, and is, as a rule, in small scales. Lasts from 2 to 6 weeks.

Complications & Sequelae. - Practically none. Kidneys rarely affected. Dukes has seen enlargement of submaxillary glands.

(B) DIFFERENTIAL DIAGNOSIS.

Scarlet fever may be confounded with many other conditions - e.g., measles, German measles, the so-called "fourth disease", diphtheria, septic rashes, eruptions due to drugs, erythema, in its different forms, smallpox, tonsillitis, influenza, erysipelas, and cerebro-spinal meningitis.

MEASLES.

As a rule, there will be little difficulty in distinguishing between measles (rubeola) and scarlet fever; but sometimes confusion may arise, especially in those cases of scarlet fever which, in the early stages, show some amount of injection of the conjunctivae, and also where the rash tends to be papular or blotchy. Sometimes scarlet fever and measles develop in the same patient; and von Leube and Fürbringer state that a positive differential diagnosis between the two may present insuperable obstacles. We must rely upon the following points:

In scarlet fever the onset is sudden, with severe prodromal symptoms, - sore-throat, vomiting, and high fever; catarrhal symptoms are conspicuous by their absence.

In measles we shall be able to obtain a history of two or three days' illness, with well-marked catarrhal symptoms, - sneezing, cough, lachrymation, photophobia - and these persist throughout the attack. Vomiting, as a rule, is absent, and the affection of the throat is limited to an inflammatory redness of the faucial and buccal mucous membrane.

The temperature in scarlet fever falls gradually, whereas in measles it shows a decided remission on the second or third day of the attack, and rises again with the development of the exanthem, - showing a sudden fall within forty-eight hours after its appearance, - and in the latter, where the glands of the cervical region may be

enlarged, we do not find a general enlargement of the glands of the body, especially of those of the inguinal region, as in the former.

The rash in measles is first seen upon the face, then spreads to the body, and the circumoral region is not exempt. It is blotchy, and consists of dark-red or bluish-red macules, with a tendency to be arranged in crescentic form, the patches often showing serrated margins, with free intervals of skin between the maculae. The rash has a velvety feeling.

In scarlet fever the rash is first seen below the clavicles, and if the face be attacked, we shall notice the peculiar circumoral pallor. The rash covers the whole body, and there are no free intervals of skin, as are to be seen in measles. In measles when the finger is lightly passed over the skin, the surface feels uneven, this sensation being due to the prominence of the individual spots of the eruption, but in scarlet fever the skin is evenly swollen; and in cases where the scarlatinal rash is of recent development, the skin will appear of a yellowish hue, if firmly stretched, but in measles this change of colour, which is faintly marked, is only seen over the spots of the eruption.

Occasionally a diffuse erythema may be seen on the second or third day in measles, on the chest or over the whole trunk, and may readily be mistaken for scarlet fever, but we shall find there is no sore-throat, and the presence of the catarrhal symptoms will give a clue.

Sometimes in scarlet fever the rash upon the extremities, and occasionally upon the trunk, may be coarsely papular, and resemble, to a great extent, the exanthem of measles, but in these cases the sore-throat, and the absence of the rash upon the face, and also the non-appearance of coryza, sneezing, cough, photophobia, etc., will serve to distinguish the two. In some cases the measles rash may coalesce, and showing a somewhat uniform, punctate, erythematous condition, may resemble

scarlet fever; but we shall obtain a history of the appearance of the rash upon the face, and although it will have coalesced upon the arms and trunk, it will present the characteristic measles appearance upon the legs. The sore-throat will be absent, or at the most, will be only slightly developed, and the temperature will show a sudden fall.

In the early stage of measles, the appearance of Koplik's spots will often enable us to make a correct diagnosis.

The tongue in measles, although sometimes it may clean very quickly, never shows the typical strawberry condition; but, according to some observers, it may, at the beginning of the illness, show some resemblance, -a condition due to the red and swollen papillae rising up above the yellowish-gray level of the surrounding epithelial layer.

An examination of the blood will show a well-marked leucocytosis in scarlet fever: in measles there is no such condition.

GERMAN MEASLES.

German measles (Rubella or Rötheln) and scarlet fever are very often confused, especially when the attack of the former is unusually severe, or when the latter is unusually mild. The onset of scarlet fever is sudden, with severe symptoms; but in rubella the prodromal symptoms are mild, the onset is insidious, vomiting usually absent, headache only slight, -whilst, as a rule, the temperature is normal, or only slightly raised-but in severe cases there may be high fever. In scarlet fever the faucial symptoms are usually characteristic, and catarrhal symptoms are absent; but in German measles the throat symptoms are only slightly, perhaps not at all, developed - though in severe cases they may be well-marked, and mild catarrhal symptoms - i.e., watery eyes, frequently occur. The tongue is clean or slightly furred, but never coated with a thick white fur, which undergoes characteristic scarlatinal peeling, and the patient frequently complains of tenderness of the glandulae concatenatae. These glands are easily

palpable, even when showing no tenderness, and although they are enlarged in scarlet fever, they are never as large as in rubella.

In rubella the rash appears first upon the face, as minute rosy red dots, and is evanescent; and whilst, in the early stages of the illness, it may resemble that of scarlet fever, it sooner or later takes on a measly type, - though, as a rule, it is pinkish and more discrete than the latter, but it is never confluent as in scarlet fever. It is frequently the first noticeable symptom, invades the circumoral region, and from the face extends to the neck and chest, ultimately covering the whole body, where it frequently assumes the bat's wing pattern, due to the minute dots becoming larger and gradually coalescing. In other cases the dots become so diffused that the rash, in patches, resembles the eruption of scarlet fever, but this appearance is never apparent from the commencement. A certain amount of desquamation, especially of the trunk and limbs, may follow, but it never shows the typical pin-hole condition.

"FOURTH DISEASE".

This disease has been described by Dukes (Lancet, July 14, 1900) and others - e.g., Watson Williams (Brit. Med. Jour., Dec. 21, 1901) - as an independent disease, usually of a mild character, and which is frequently mistaken for scarlet fever. The diagnostic points between the two are as follows:

In the fourth disease the prodromal symptoms are usually absent, the conjunctivae are pink and suffused, and whilst the rash is similar to that in scarlet fever, it begins, as a rule, upon the face, and is frequently followed by desquamation, which may be out of all proportion to the intensity of the rash. The prodromal symptoms are usually absent, even if the rash be copious, and although the patient may have a slight sore-throat, he rarely feels ill; but in rare cases, where the attack is severe, he may complain of headache, anorexia, malaise,

and even backache. The tongue never shows the typical strawberry condition, and it may not even be slightly furred. If sore-throat be present, the fauces have not the typical punctate appearance of scarlet fever, and although they may be reddened, the condition bears but little relation to the extent of the rash.

The eruption is the first noticeable symptom, and is seen over the whole body in a very few hours. It is diffuse, slightly raised above the surface of the skin, and is of a bright, rosy-red hue. Even when the rash is copious, the skin does not feel so pungently hot as in scarlet fever.

The lymphatic glands, especially the post-cervical, the axillary, and the inguinal, are usually enlarged and tender, and feel like peas, but the enlargement is not so marked as in German measles.

Desquamation usually occurs, but varies. It may be very slight, or it may be general, and extends to the hands and feet. It bears no relation to the intensity of the eruption, for a copious eruption may be followed by little or no peeling. As a rule, the desquamation occurs in small scales rather than in flakes or sheets.

SMALLPOX.

The prodromal rash which occurs in some cases of smallpox, and is of an erythematous and sometimes punctate character, may be mistaken for scarlet fever. In the first place, the age of the patient may be of help in the differential diagnosis, as these prodromal rashes of smallpox rarely occur in young children, and scarlet fever is rare in adults. The premonitory symptoms are severe in both diseases, but in scarlet fever they are of shorter duration (one day), whereas in smallpox they last for two or even three days. A definite rigor, although common in smallpox, is rarely seen in scarlet fever, but vomiting is of frequent occurrence in both diseases. Severe lumbar pain is suggestive of variola; and the pulse is rapid and the temperature high in both; but, whereas

the former is increased out of all proportion to the latter in scarlet fever, their ratio is undisturbed in smallpox.

In scarlet fever the rash is of a vivid red hue, and appears first upon the neck and chest, but in smallpox, where its colour is dull and red, it appears on the lower part of the abdomen as a triangular patch, with the base a line drawn through the anterior superior iliac spines, and the apex at the pubes; it may be also well-marked on the inner surface of the thighs, in the groins, and in the axillae. In some cases it may be more or less general, and in them it will appear on the extensor surfaces of the limbs; when it is to be seen on the feet, it is found to run along the line of the extensor tendon of the great toe.

In smallpox the characteristic strawberry tongue is absent, and there is no sore-throat; but in some cases, where there may be a reddening of the fauces, there is no swelling and exudation as in scarlet fever. In smallpox the enanthem appears on the palate and pharynx, and is papular, whilst the swelling of the lymphatic glands about the lower jaw, usually seen in scarlet fever, is rarely, if ever, present in smallpox.

ERYSIPELAS.

As a rule, in a typical case of erysipelas there should not be much difficulty in arriving at a correct diagnosis, but sometimes when erysipelas occurs just after an operation, or develops in the early part of the puerperium, some confusion may exist, and under these circumstances we must wait for the appearance of the characteristic symptoms.

In differentiating between erysipelas and scarlet fever we must rely upon the place of occurrence, the manner of development, the peculiar distribution, and the mode of extension. In the latter the rash is punctate, whereas in the former this appearance is absent. In erysipelas there is a well-marked oedema of the connective tissue, and we notice the spreading edge of the

rash, which is slightly raised above the level of the surrounding skin. Vesicles may also occur, and although desquamation may follow, it is never seen except on those parts where the rash has been present. In scarlet fever, however, desquamation may occur in places where there has been no antecedent eruption. In erysipelas there is no strawberry tongue.

URTICARIA.

This disease will scarcely ever be confused with scarlet fever.

DESQUAMATIVE ECZEMA.

In this disease the skin is red and oedematous, and at the commencement of the attack the general symptoms are frequently severe. Minute vesicles, closely resembling sudamina or a miliary eruption, may accompany the rash.

INFLUENZA.

In the majority of instances, especially if influenza is epidemic in a district, and if, at the same time, scarlet fever is absent, little or no difficulty will be experienced in arriving at a diagnosis, but if both are epidemic at the same time, confusion is sure to occur. The cases which cause the most anxiety are those which are characterised by high fever, severe constitutional disturbance and prostration, and which are accompanied by a bright scarlatiniform rash, even if it be known that there are no cases of scarlet fever in the district, and in some instances it will be impossible to give a sure diagnosis. In influenza, as a rule, there is no enanthem, but the exanthem may be first observed on the chest, and may look very much like a mild scarlatinal rash, and in some cases vomiting may be an early and prominent symptom, whilst slight desquamation may occur towards the end of the illness. The tongue will not show the typical strawberry condition (though this may be absent in scarlet fever), and perhaps the early occurrence of some

respiratory complication may help us to decide in the favour of influenza. Another point is that influenza attacks people who have had an attack of scarlet fever, and it may occur several times within a short period in the same individual.

ACUTE CEREBRO-SPINAL MENINGITIS.

This disease is sometimes mistaken for scarlet fever, owing to the occurrence of sore-throat, convulsions, and the appearance of an eruption (spotted fever). The onset, as a rule, is gradual, but may be sudden; there is severe pain at the back of the head, spreading down the spinal column, and radiating into the limbs and abdomen, stiffness at the back of the neck, and retraction of the head. The eruption is petechial is character. Koernig's sign is absent in scarlet fever.

ERUPTIONS DUE TO DRUGS.

Many drugs - e.g., quinine, belladonna, antipyrin, opium (morphia), antitoxin, give rise to eruptions closely resembling that of scarlet fever, but little difficulty should arise in forming an accurate diagnosis if the history of the case be properly considered.

Quinine. - The appearance of a scarlatinal rash is frequently seen after the administration of quinine, and it usually occurs first on the face and neck, then on the trunk and limbs. Vomiting sometimes occurs, and we frequently notice some pyrexia and constitutional disturbance, - usually the result of the condition for which the drug is prescribed. The rash (erythema) shows a well-defined margin, is not punctate, and is attended with severe itching, frequently followed by branny desquamation. If there be any doubt about the rash, it will disappear if the use of the drug be discontinued.

Chloral. - This drug sometimes causes an erythematous rash resembling that of scarlet fever. There will be no sore-throat, although the mucous membrane of the pharynx may be reddened, but there may be slight

constitutional symptoms, accompanied with a slight elevation of temperature (one or two degrees). Here again the punctate character of the rash is absent, and we shall be able to obtain a history of the administration of the drug.

Antipyrin. - Frequently causes an erythematous eruption of a scarlatinal type; and Guinon (See Moizard, loc. cit., p. 153) records a case where a scarlatiniform eruption, associated with sore-throat and high fever, was caused by this drug. As a rule, the eruption caused by antipyrin resembles measles more than scarlet fever, and is a polymorphous erythema.

Morphia when taken by the mouth (not hypodermically), may cause a similar rash to that of scarlet fever.

Antitoxin frequently causes great difficulty, and here we must mainly rely upon the history of the case.

Belladonna when taken internally, and even when applied externally, may cause severe symptoms associated with a rash of a scarlatinal character. In these cases there will be dryness of the throat, widely dilated pupils, and in some cases, elevation of temperature, quick pulse, and violent delirium. The rash is of a bright red colour, but is not punctate. There should not be any difficulty in diagnosis if we are aware of the administration of the drug, but if this be not the case, careful enquiry into the history must be made.

DIAGNOSIS IN THE NEWLY-BORN INFANT.

To diagnosis scarlet fever in a newly-born infant may be a matter of impossibility, and great care must be taken in giving an opinion. It is rare under one year of age, and the mouth and skin are so peculiar in newly born children, that it is almost impossible to form a correct diagnosis. If we were suspicious that an infant had scarlet fever, the subsequent occurrence of desquamation would render the diagnosis certain.

DIAGNOSIS IN COLOURED RACES.

In coloured races it is very difficult to make a diagnosis, and in these cases we are compelled to trust to the nature of the enanthem more than to the character of the exanthem. In a very dark-coloured negro, it is evident that, although the eruption may be easily detected, the redness is not apparent, except in those places where the skin is not so dark - e.g., the axillae, the palms of the hands, and soles of the feet. In these situations the rash, as a rule, is fully developed. The general symptoms of the disease are the same as in the white races, and desquamation also occurs.

In a mulatto or octaroon, the difficulty of diagnosis is not so great, as the scarlet colour of the exanthem is readily discernible.

ERYTHEMA.

There is frequently a striking resemblance between the rashes of the different forms of erythema and scarlet fever, and it is of the utmost importance to make an early diagnosis. As a rule, these erythematous rashes are of a fleeting character, have a distinct margin, and the puncta, socharacteristic of scarlet fever are absent. The glands, as a rule, are not, or only slightly, enlarged, there is no sore-throat, little or no fever, and usually the constitutional symptoms, if present, are mild. It is important to note that the mucous membrane of the palate may be affected in all forms of erythema of the skin.

Erythema fugax, and idiopathic roseola are the most frequently mistaken for scarlet fever.

In erythema fugax red patches appear upon the face and trunk. These patches are of a transient nature, and the cardinal symptoms of scarlet fever are absent.

Idiopathic roseola (erythema roseola) may be local or general, and may be papular or consist of irregular red patches. Its duration may be several days, and whilst disappearing in one place, may reappear in

another. As a rule, there is slight pyrexia and restlessness, and the palate may be reddened. It usually occurs in children, and its distinguishing features are: the absence of sore-throat, its patchy distribution, and its disappearance, and reappearance. It may be followed by slight branny desquamation.

Erythema Scarlatiniforme.- This may be mistaken for scarlet fever, as it may be of sudden onset, with slight constitutional symptoms, and an elevated temperature (100° - 101° F.). The fauces are reddened, but there is no sore-throat, and the rash, which is of a bright red colour, is punctiform. The temperature, as a rule, subsides very quickly, and the rash is distinguished by its tendency to begin in any part of the body, its irregular distribution, and in certain areas - e.g., about the nose, - it is often sharply defined.

French writers have differentiated a condition very much like the above, but followed by desquamation, and have called it Erythema Scarlatiniforme Desquamativum. The constitutional symptoms are, as a rule, slight; there is a mild sore-throat, and an erythematous rash, which is usually diffuse, and followed by desquamation. In some cases the mucous membranes may be affected, and the tongue may peel, and show a red, smooth surface, but the characteristic red strawberry appearance is not seen. These cases may present great difficulty in diagnosis, and we must rely upon the following points:

1. The constitutional symptoms are usually mild.
2. The strawberry tongue is absent.
3. The fauces are not markedly swollen, and the superficial lymphatic glands are only slightly enlarged.
4. The eruption lasts longer than in scarlet fever, is frequently limited to certain areas of the body, the margin of the rash may be sharply defined, and the rash has a greater tendency to become diffuse rather than punctiform.
5. History of previous attack.- The disease has a great tendency to recur.
6. Occurs in those who have had scarlet fever.

CATARRHAL SORE-THROAT.

This condition may present some difficulty if seen before the time for the appearance of the scarlatinal rash. The fauces are usually swollen and reddened, and although, as a rule, not showing the punctate appearance, may resemble the milder forms of scarlet fever, but when the exanthem of the latter appears, the diagnosis is clear. In those cases of scarlet fever where the rash is absent, or very slightly developed, it is impossible to form a diagnosis, until the appearance of the desquamation, or of some characteristic complication.

TONSILLITIS.

In acute follicular tonsillitis the diagnosis is frequently difficult, or may be impossible, at any rate, until the typical scarlatinal eruption appears; and even then the difficulty does not end, for tonsillitis may be accompanied with an erythematous rash, which, however, is usually limited to the chest and neck. This erythema is of short duration, does not show the punctate appearance, and is not followed by desquamation.

Sometimes the onset of tonsillitis is sudden, with high temperature (though, as a rule, the temperature is higher in the early stages of tonsillitis than in scarlet fever), quick pulse, and grave constitutional symptoms associated with much depression. The pulse is not quickened out of proportion to the height of the temperature, and, as a rule, vomiting and convulsions are absent. The mucous membrane of the pharynx is reddened, and the tonsils are red and swollen, with plugs of exudation filling their crypts. There is great pain in swallowing, but the swelling of the tonsils is usually, at any rate for a time, greater on one side than the other. The lymphatic glands are usually swollen, though perhaps not to the same extent as in scarlet fever, but the tongue, which remains coated throughout the attack with a creamy fur, does not show any swollen and injected papillae, and

never peels, even at the tip and edges - i.e., the strawberry condition is absent.

It is better to quarantine the patient in the early stages until a diagnosis has been made.

GRANULAR PHARYNGITIS AND HERPES OF THE TONSILS.

These should present no difficulty in diagnosis, and be readily distinguished from scarlet fever.

SEPTIC RASHES.

Septic Rashes may cause great difficulty, but we should rely upon the history of the case, and notice the duration and characteristics of the rash. In many cases we shall be able to find an unhealthy wound, or some other cause of the septicaemia, whilst at the same time the sore-throat is absent, and the rash does not appear at the normal place. According to Litten (Charité-Annalen, Bd 7, S. 178):- "In septic infections an erythema sometimes makes itsappearance and spreads in the shortest time over the entire body. It is of an unusually deep purple colour. The nature of its development and appearance resemble so completely the scarlatinal exanthem that I know no differentiating characteristic to distinguish between the two conditions. Even the same localities that usually remain free in scarlatina remain also unaffected in the septic erythema. The face is likewise markedly congested, the conjunctivae injected, and the nasal secretion is increased. Moreover, the tongue may assume an intense reddish colour at its edges. Miliary eruptions often occur as a complication. If death does not follow upon the acme of the skin affection, desquamation ensues, without any simultaneous fall of temperature, fully resembling in this particular the state of affairs in scarlatina". According to this statement, the skin affection is of very little value in the differential diagnosis.

In the septic form of scarlatina, frequently about the end of the second week, a rash appears,

consisting of raised spots, or somewhat larger blotches. These are usually limited to the cheeks, buttocks, extensor surfaces of the larger joints, and to the parts which are liable to pressure. This rash may cause us to think of an intercurrent attack of measles, but the spots which are, as a rule, more raised, are usually of a brighter tint, or of a more distinctly brown colour than the measles rash, whilst at the same time they are, as a rule, not so persistent. They disappear on pressure, and frequently fade, but reappear in the course of a few hours.

DIPHTHERIA.

Great difficulty in the diagnosis between diphtheria and scarlet fever occurs frequently, because in the former the faucial affection is not always characterised by the formation of membrane, whilst in the latter membrane may frequently be seen; and, again, in diphtheria, a toxic erythematous rash, which may be mistaken for the scarlatinal exanthem, frequently appears. It is to be remembered that scarlet fever may develop during an attack of diphtheria, usually at an early stage of the disease, whilst diphtheria may also occur in a patient who is suffering from a scarlatinal attack, but, as a rule, it does not develop until a later stage of the disease.

In both we may obtain a history of exposure to the specific infection as the case may be, and in scarlet fever we shall notice the sudden onset, with well-marked symptoms, high temperature, quick pulse, delirium, and vomiting, whilst in diphtheria the onset is more gradual, the patient often complaining of malaise, vague pains, etc., for two or three days, the temperature is not so high, and vomiting is rare. In children convulsions may occur at the onset of diphtheria as in scarlet fever, and difficult and painful deglutition are common to both. The mucous membrane of the fauces is usually redder in scarlet fever than in diphtheria, and has a punctate appearance, and when the exudation is pultaceous, and not distinctly

membranous, scarlet fever may be suspected if the febrile symptoms and vomiting are well marked.

The exudation in diphtheria invades the pillars of the fauces, the uvula, and the palate, is usually thicker, especially at the margin, and for a time is more adherent, and bears no relation to the intensity of the tonsillitis, whilst in scarlet fever it is usually limited to the tonsils, and is dependent upon the intensity of the associated tonsillitis.

The surrounding mucous membrane in diphtheria is usually of a pale pinkish colour, with a glassy appearance, but in scarlet fever it is usually dark and angry-looking, with a somewhat dry and sticky appearance.

In diphtheria the membrane is of a grayish-yellow or whitish colour, firm, and compact, and can be separted in its entirety. In scarlet fever it is of a brownish or yellow colour, is softer, and looser, and is separable only in portions, whilst it never rolls up, and crinkles when separating as in true diphtheria.

In scarlet fever ulceration and gangrene of the fauces are very common, but they are rare in diphtheria, where ulceration, when present, is only superficial. Perforations of the soft palate are characteristic in scarlet fever, but do not occur in diphtheria.

In scarlet fever the membrane frequently disappears in a day or two, or is represented by a necrotic surface on the tonsil, which rapidly passes on to ulceration. The surface is now of a grayish-white, woolly appearance, and the process may extend both superficially and in depth, and ultimately lead to wide-spread destruction of the tissues of the fauces.

In scarlet fever the membrane rarely extends to the larynx, and in those cases where there is this extension, the symptoms are those of "usual inflammatory croup" (Bohn, in Gerhardt's Handbuch, p. 269). In this form of croup the laryngeal embarrassment comes on much quicker than in true diphtheria.

In diphtheria the membrane usually appears upon the tonsils early in the disease, may be on the first or second day, whereas in scarlet fever the diphtheroidal condition of the throat appears much later.

In diphtheria the strawberry tongue does not appear, while the renal lesions are much less frequent than in scarlet fever, and paralyses are more likely to occur in diphtheria than in scarlet fever. If paralyses occur in the latter, there must have been a double infection.

Henoch (loc. cit., p. 665) says that regurgitation of fluids through the nose is not a sign of paralysis of the soft palate, but is due to the excessive swelling of the parts, the result of the processes in scarlet fever. In these there is no anaesthesia of the soft palate, no loss of the reflexes, and no paralysis of accomodation (i.e., paralysis of the muscles of the eyes or palate).

In those cases of diphtheria in which an erythematous rash appears diagnosis may be difficult, but, as a rule, it is darker than the scarlatinal rash, is not punctate, usually appears on the trunk, whilst the extremities are unaffected, and shows rapid extension over a more or less limited area, frequently fading when first seen as it advances. It very often disappears, only to reappear again, is of a fleeting character, of irregular distribution, and is not followed by desquamation.

In diphtheria we shall find the Klebs-Loeffler bacillus in practically all cases, and perhaps other bacteria - e.g., streptococcus pyogenes, staphylococcus albus, - but in scarlet fever, although we may isolate the latter, together with other putrefactive bacteria, the Klebs-Loeffler bacillus is never found. The demonstration of this characteristic bacillus is the only means of settling the diagnosis between a mild case of scarlet fever without rash and a case of diphtheria, in which there is no membrane on the throat, and which presents the appearance of a simple catarrhal sore -throat.

In the "Lancet" of November 7th, 1903, H.E.J.Biss writes upon "The Borderlands of Diphtheria and Scarlet Fever", and points out the great difficulties the physician often encounters in attempting to classify accurately every case he is called upon to treat. He cites a number of cases which have come under his observation, showing that scarlet fever, tonsillitis, and diphtheria shade gradually into one another, and in many cases an absolute diagnosis is an impossibility. When the diagnosis of such cases has been made on hard and fast lines, mistakes frequently occur, the results of which are to be seen in the outbreaks of diphtheria which occur in a scarlatinal ward, and of scarlet fever in a diphtheritic ward. To avoid such errors may in some cases be an impossibility, but, as a rule, he thinks these cases usually show some ambiguity, which if it had been detected would have prevented the outbreak. He says: "Much has been said of late, said glibly enough too, about errors of diagnosis in infectious diseases. One wonders if it is realised by those who speak thus that, apart altogether from clinical difficulties, such as eliciting physical signs, recognising rashes, and so forth, there are an appreciable proportion of these cases, which are undiagnosable".

Again, he says: "There are many minute points, often difficult to describe in language and quite impossible to impart fully, that one gets to look to for help after a time, and intangible as these may be to an outsider or one not constantly in contact with these diseases, they are of great practical moment. The tint of the skin will often suggest scarlet fever; the comparitive pallor of the throat diphtheria; decubitus again, septic infection; and so on. After all has been said, diagnosis in these diseases is only capable of being taught up to a certain point, and it is not till the knowledge has become intuitive that the fine points which suggest aberrance from one mean and approximation to another can be appreciated, and even this instinct is only capable of limited discrimination".

PROGNOSIS.

Owing to its treacherous nature, one should be very guarded in giving a prognosis in scarlet fever, at any rate, until one month has elapsed from the beginning of the attack, for frequently we see a case which has been of the mild type, and is running a favourable course, suddenly develop some dangerous complication, which may have a fatal termination.

To a great extent the prognosis depends upon the nature of the epidemic, and it is an impossibility to form any opinion from the character of the initial symptoms. Epidemics show wide variation in their gravity; some are mild, others severe, whilst, on the other hand, some may begin as malignant and end as mild, or begin as mild and end as malignant. The latter occurrence has been frequently noticed, but why it is so has not yet been determined.

Age has a great influence upon the prognosis, the mortality in adults being much less than in children. It is most fatal in early childhood, in those under five years of age, than in those who are older, and it is greatest in the first year. (Dukes says in the third year). Johannessen (loc.cit., p.146) found the mortality for the twelve years between 1867 and 1878, in children under one year of age, to be 10.3 per cent. During the first five years of life, the younger the child the more likely it is to die, whilst after the fifth year, the fatality diminishes up to the age of puberty, and reaches the lowest between that time and the twenty-fifth year. After this age, there is a slight increase with advancing years, but it never reaches the mean. Sometimes when scarlet fever occurs in an adult, there may be a great predisposition on the part of the person attacked, so we should be careful in giving an opinion as to the ultimate result of the case.

Sex does not appear to affect the prognosis, as it is only about 1 per cent. more fatal in males than in females.

Season, locality, and the state of the atmosphere at the time of the outbreak have all been supposed to play an important part in influencing the course of an epidemic, and so affecting the prognosis, but as yet they cannot be said to afford much help in forming an opinion. Four out of the five fatal cases in the Swallownest Hospital came from the same street in one village; there must have been some peculiarity inthat street to account for the disease being more virulent there than in any other part of the village.

The mortality is much higher in the autumn than at other seasons; and we should expect this to be the case, for it is much more prevalent then than at any other time.

In fever hospitals the mortality is sometimes much higher than in private practice during the same epidemic; but this may be explained by the majority of severe cases being taken there.

Social conditions and hygienic surroundings under which the patient lives play an important part, and so influence the prognosis. It is only natural to expect that in those who are surrounded by luxury, living under the best possible hygienic conditions, and who are able to obtain medical treatment and good nursing at the earliest sign of danger, the mortality would be lower than in the poor, ill-fed children of the slums, who have frequently little vitality, and who lack the means to obtain efficient treatment, nursing, and isolation. But, again, we must not forget that while social conditions do not make any difference in the degree of susceptibility to the infection, some members of certain families of the rich, show a peculiar predisposition to the scarlatinal infection, so that, even when the epidemic is mild, the whole, or several, members of a family may be affected by the disease in its most malignant form, frequently ending in death, whilst other members of the same family may escape, or only develop a very mild attack. Unfortunately, we have no means of foretelling those people who are the subjects of this idiosyncrasy.

In those children who are ill-fed, and who live under bad hygienic surroundings, the septic form of the disease is very common, and is attended by a high mortality; and it would seem that such children are predisposed to have the disease in a severe form. As a rule, there is a greater fatality amongst the inhabitants of the poorer districts of the large cities, even though they are removed to the hospital at an early date.

State of Health. - When a person who is the subject of some disease, develops an attack of scarlet fever, the prognosis has to be considered, not only as to the ultimate result of the scarlatinal attack, but also as to what will be the effect upon the existing complaint.

In puerperal women the prognosis is extremely grave, as the attack is usually very severe, and the mortality very high. It is more fatal when occurring just before or immediately after labour.

In surgical scarlatina the outlook is, as a rule, bad; although Caiger (loc. cit., p. 150) says the attacks "are usually characterised by excessive mildness, nevertherless it is not uncommon for those who are actually suffering at the time from some other infectious disorder to have the disease in a very severe form".

Scarlet fever, as a rule, has an unfavourable influence upon all diseases of the lungs, and in those patients who are tubercular, recovery from scarlet fever is slow, whilst complications are common, and the tubercular lesion, no matter what it is, often becomes rapidly worse - .e.g., in those who are the subject of pulmonary phthisis, and in whom the process was either latent or running a chronic course, scarlatina often speedily brings about a fatal termination. Scarlet fever occurring in the weak and enfeebled renders the prognosis very grave, and in those patients who are the subjects of renal disease, the already existing condition is usually aggravated, and uraemic symptoms are apt to occur, frequently ending in death.

When patients who are suffering from chronic heart

disease are attacked by scarlet fever, the gravity of the prognosis is considerably increased, but frequently recovery takes place without any aggravation of the cardiac affection.

MORTALITY.

The mortality varies greatly in different outbreaks, but the tendency has been for a greatly diminished death-rate, for during the last fifty years the mortality has diminished by about 70 per cent. This decrease is due, not only to the provision of isolation hospitals, and the lessened virulence of the disease, but also to the greater care bestowed by many parents upon their children during the earlier years of life. Although during late years the tendency has been for the disease to occur in more or less of a mild type, it may break out with great virulence at any moment.

The absolute frequency of scarlet fever at any given time, and the extensiveness of the epidemic, do not stand in any definite relation to the severity of the attack - i.e., although the prognosis in any given epidemic, taken as a whole, may be good or bad, it can in any event modify but slightly that of the individual case.

Even in sporadic cases the mortality may be high - e.g., in Stockholm, in 1868, out of 11 cases there were 5 deaths, or 45.4 per cent.

The average case mortality is about 8.5 per cent., though it may vary from 3 per cent. to 10 per cent. In the isolation hospitals of the Metropolitan Asylums Board in 1890, where the admissions were 10,343, the average case mortality was 2.97 per cent.

Johannessen (loc. cit., Tabelle V, and S. 137) states that during the years 1867 to 1878 the mean percentage mortality of scarlatina was 6.6 per cent. of the deaths occurring from all causes. The figures varied between 2.12 per cent. and 12.5 per cent. He also collected 84,580 reported cases with 12,789 deaths in

Norway, and concludes that the mortality is 14.17 per cent. He thinks that when the mortality is 13 per cent. normal conditions prevail; when it goes above that figure, the epidemic is a severe one, and when it is below it is mild. He also reports that in a certain epidemic in Norway the mortality was 90 per cent.

In Sweden (Lennmaln bei Carlsson, loc. cit., P.325), during the years 1861 to 1885, there was a mean percentage of 3.7 per cent. (of the total mortality) in the cities, and of 3.8 per cent. in the country.

In Stockholm (Cited by Sture Carlsson from Lennmal: "Nagra anteckningar om Skarlakansfebern pa Katarina Sjukhus", Stockholm, 1895) -

In 1865	-	2019 cases	-	56 deaths	=	2.8	per cent.
" 1869	-	1190 "	-	327 "	=	27.5	" "
" 1870	-	565 "	-	163 "	=	28.2	" "
From 1865- 85	-	15137 "	-	2461 "	=	16.3	" "

In Hamburg ("Bericht des Medicinalraths (Dr.J. Renicke) ueber die med. statist. das Jahr, 1894", S. 58)-

In 1886	-	3105 cases	-	348 deaths	=	11.2	per cent.
" 1891	-	2902 "	-	133 "	=	4.6	" "
From 1885- 94	-	21,834 "	-	1475 "	=	6.8	" "

In Bavaria ("Die Epidem. Kinderankh. in Bayern Während der period 1857-58 und 1868-69". Karl Mayer, Jour. der Kinderkr., 1871, Bd. 56, S. 161) - During the years 1857-58 and 1868-69 a mean average of 1.5 per cent (of the total mortality: out of 1,706,200 deaths, 25,740 were of scarlatina). Variations from 0.8 per cent. (1860-61) to 3.2 per cent. (1868-69).

Thomas (loc. cit., p. 291) says that in Saxony a mortality of from 13 per cent. to 18 per cent. is very common, but that it not infrequently rises to 25, and sometimes even to 30 or 40 per cent., and he also considers that the normal mortality from scarlet fever is 10 per cent. When it is above this, the epidemic is severe, when below, it is mild (i.e., of a benign character).

Hirsch (loc. cit.) says the mortality may vary from 3 to 30 per cent., and he agrees with Thomas that the average mortality is 10 per cent.

According to Hillier, in the London Fever Hospital the mortality varies from 1 to 6 to 1 to 40, and in the Children's Hospital from 1 to 3 to 1 to 11. In London, in 1892 and 1893, the mortality was 4.3 per cent.

According to Graves, when scarlet fever appeared in Dublin, between 1805 and 1833, it was always mild, but during 1834 and 1835 the city was the seat of a very malignant and fatal epidemic.

Moore ("Eruptive and Continued Fevers", Dublin, 1892, p.161) gives the mortality from 13 per cent. to 40 per cent. In London from 1861 to 1865, the mean total amounted to 4.2 per cent., with a variation between 2.4 per cent. and 7 per cent.

McCollom (loc. cit.) gives the mortality as 9.8 per cent. in a series of 1,000 cases, and he also states that in 1898 in the city of Boston, the mortality was 16.77 per cent. In some epidemics the mortality may be as high as 30 or even 40 per cent., and, as a rule, it is lower than 10 per cent. in private practice.

In the Swallownest Hospital out of 231 cases the mortality was only 2.1 per cent.

At the beginning of the illness, although we should be most careful not to express an opinion as to the ultimate result of the case, we may have a favourable outlook (i.e., the immediate prognosis is good) when the onset is mild, and the rash appears early and is diffuse. Also if the temperature and pulse are only moderately increased, and when the faucial symptoms are not severe, and the cervical lymphatic glands not seriously involved. Also when the temperature and pulse fall when the eruption disappears. According to Forchheimer, as a broad rule, we may say that if violent symptoms on the part of the nervous system do not appear within the first seventy-two hours after the inception of the disease, the chances are that we are dealing with a non-malignant case of scarlatina.

The following conditions are of ill-omen, and affect the prognosis unfavourably:

Persistent vomiting and profuse diarrhœa, especially the former.

An abnormally high temperature (hyperpyrexia), and also an especially low subnormal temperature. When the temperature rises above 104° F., and continues at this height into the third week of the illness. In some fatal cases of scarlatina maligna, the temperature may not be high, but there is great disturbance of the brain and of the heart.

When the pulse is out of relation to the increased ratio normal to scarlatina. When the rate is above 130 (160-200) per minute, and when the pulse is small and thready, or rapid, soft, feeble, or irregular. Indistinct cardiac sounds, cyanosis, sighing, or irregular respirations great dyspnoea, and threatened collapse are extremely bad signs, as is also a waxy and yellow appearance of the skin, frequently seen in the septic form of the disease.

The appearance of nervous symptoms that cannot be explained by the increased temperature. Delirium, restlessness, pain, and more or less somnolence are nervous symptoms we may expect in all normal cases of scarlet fever, but stupor, coma, convulsions, are to be looked upon as signs of evil import. Extreme restlessness, sleeplessness, and continued delirium, early obscuration of the mind, and tremors should be considered to be of ill omen. Delirium, especially when occurring in adults, always indicates a severe attack; and Trousseau says that the occurrence of convulsions during the first or second day is always a sign of danger, whereas in other exanthemata it is not of evil omen.

The mode of appearance of the eruption is of great prognostic value. It may develop, and in the presence of unpleasant general symptoms disappear, and in severe cases it may appear in an irregular manner - e.g., first on the limbs, or the back instead of on the neck and chest. In

mild cases the rash may be poorly developed, and irregular in situation, but it is fainter, more evanescent and is associated with mild constitutional symptoms, but in severe cases, it is not only poorly developed, and irregular in distribution, but is of an intense colour.

A copious rash, of a dusky red colour, passing into a livid hue is a bad sign. Trousseau says that the more intense the rash, the more severe is the disease, but in this he differs from most observers. Perhaps he meant in those cases showing a bright red eruption covering the whole of the body, and lasting for an unusually long time. About 80 per cent.of cases showing a septic eruption are fatal, and a petechial rash, with cold and cyanotic extremities, is an exceedingly unfavourable sign.

Forchheimer (loc. cit., p. 85) says "the haemorrhagic forms of the eruption are not always the mark of a malignant attack. As a rule the haemorrhagic forms of the eruption are most common in bad cases, but the fact still remains that in some individuals any form of eruption that takes place upon the skin will become haemorrhagic without this meaning anything especially bad. In order to determine the nature of the attack, the character of the eruption, and the place of its appearance combined with the general symptoms, will always be sufficient".

Eosinophiles are said to be absent in a bad case, but increased in favourable cases.

Fauces. - Severe involvement of the throat, the nose, and the air passages - i.e, ulceration of the fauces, and necrotic inflammatory processes originating inthe pharynx, attended with gland infiltration, high temperature, rhinorrhoea, otitis, adenitis, cellulitis, etc., are of unfavourable omen. Carlsson (loc. cit., p. 62) states that in 4,000 cases the total mortality was 18.5 per cent.; whilst of those suffering from severe pharyngeal involvement (49.8 per cent. of the 4,000 cases showed this symptom) 28.78 per cent terminated in death.

When there is a great amount of oedema of the parts, or much exudation, the prognosis is grave. In those cases in which the former exists, symptoms of cardiac failure are apt to appear, but if they do not, and the patient survives the first four or five days of the illness, the oedematous condition is likely to be followed by sloughing, with the usual risks of septicaemia, or in a few cases by haemorrhage from the vessels in the neighbourhood of the tonsils. In those cases characterised by a great amount of exudation, it is frequently difficult to ascertain the condition of the underlying mucous membrane, but as soon as this has cleared off, ulceration, and in some cases perforation of the soft palate can be seen. These cases are not always fatal; many recover, though slowly, but there are some in which certain symptoms are met with (symptoms bearing no relation to the amount of ulceration), which frequently end fatally with exhaustion. These symptoms are vomiting, diarrhoea, progressive emaciation (though frequently the patient takes and retains a sufficient amount of nourishment), and a moderately frequent pulse, which is also persistent. These cases are apt to prove deceptive; for, owing to the temperature having fallen to the normal, the pulse-rate being lower than before, and the disappearance of restlessness and delirium, we are apt to think that the patient is on the high-road to recovery.

Malignant scarlet fever is the most fatal; next in frequency comes the septic variety; and, lastly, the typhoid form. In the malignant, and in most cases of septic scarlet fever, death, which is usually due to heart failure, may occur during the first, second, third, or fourth day of the illness; but, as a rule, it supervenes gradually at a later period. In the typhoid form of scarlet fever death is usually the result of exhaustion.

PROGNOSIS AS REGARDS THE COMPLICATIONS.

In an ordinary attack of scarlet fever, the prognosis is affected to a great extent by the

complications. A general septic infection is to be dreaded, as being of the gravest significance, and may not manifest itself until the second week of the disease.

Diphtheria. - When this occurs the prognosis is exceedingly grave, owing to the frequency with which it involves the larynx. This laryngeal involvement is apt to occur at an early stage, and causes the mortality to be very high.

Rheumatism. - As a rule, and especially when mild, rheumatism does not add greatly to the gravity of the case. It is rarely followed by chronic heart disease, and the prognosis is good.

Otitis. - This should always be looked upon with the gravest suspicion, as it may lead to pyaemia, thrombosis of the lateral sinus, etc.

The formation of abscesses in the glands, and in the joints (frequently the result of sepsis) must be considered of evil omen.

Cervical Cellulitis. - This is very unfavourable, especially in those cases where it is at all extensive. There is sloughing of the skin, and subcutaneous tissue, and the patient runs all the risk of septicaemia, pyaemia, haemorrhage, and exhaustion. When the cervical cellulitis occurs alone, the prognosis is very grave, although the case is not absolutely hopeless; but when it accompanies severe pharyngeal complications, the ending is usually fatal.

Involvement of the serous membranes is usually an unfavourable sign, especially when the effusions into the serous cavities of the body are large. When pleurisy and peritonitis occur, they are usually septic.

Affections of the Air-passages. - When there is a great oedema of the fauces there will be great obstruction at the entrance of the larynx; and when the pharyngeal processes begin to ulcerate and necrose, septic matter is apt to get into the lungs, frequently causing

broncho-pneumonia, abscesses, etc., and usually ending in death.

Bronchitis, especially if diffuse, and affecting the smaller tubes, and broncho-pneumonia (lobular pneumonia) are very fatal, especially when occurring in young children. Lobar pneumonia (croupous pneumonia) is not so fatal, and usually ends in recovery, except when the patient is exhausted, and the heart is not in good condition.

Cardiac Involvements. - These always give rise to much anxiety, especially when at all severe. A very rapid pulse is an unfavourable sign, especially when there is not at the same time a very decided rise of temperature without any typical phenomena of intoxication. If the pulse is very frequent, small, and irregular, with a moderate rise of temperature, or if the hands, feet, ears, and tip of the nose feel cold, the patient is in the gravest peril.

Nephritis. - When this appears the prognosis is always more unfavourable, and it also favours the occurrence of inflammatory exudates, making the outlook much worse. Its occurrence varies in different epidemics, and the mortality also varies, and its appearance is quite independent of the nature of the attack of scarlet fever. It occurs oftener in children from five to nine years of age, and somewhat more frequently in males than in females, and it is also more fatal in the former. The age of the patient is of importance from the point of view of prognosis, - for the case mortality of nephritis is much higher for those under five years of age, than for any other period of life.

The amount of urine excreted in the twenty-four hours is the chief guide as to the severity of this complication; as long as the urine remains scanty, the condition of the patient is precarious; well-marked uraemia is mostly fatal, and whilst coma is an unfavourable symptom, convulsions are less so. If the urine contains much albumen after the acute febrile

symptoms have passed away, recovery is likely to be very tedious, and cases of nephritis supervening upon an unrecognised attack of scarlet fever are often severe, and of long duration, - because, in these cases the nephritis, as a rule, has been neglected, and has not been discovered until dropsy appeared.

Scarlatinal nephritis, in the majority of cases, ends in recovery; sometimes we meet with cases which take on a chronic course.

TREATMENT.

Up to the present time all attempts to stamp out scarlet fever have ended in failure, and until it is possible to give an accurate diagnosis in every case it will not be eradicated.

PREVENTION.

Whenever a case of scarlet fever comes under observation, it is obvious that the first and most important point to the physician is the taking of the necessary steps to limit the spread of the contagion, and to do this it is absolutely imperative to keep the patient from contact, both direct and indirect, with healthy people during the course of the illness. To do this thoroughly may not only be extremely difficult, but absolutely impossible when the patient is nursed at home, and the most efficacious treatment is to send him with all convenient haste to an isolation hospital, as scarlet fever can be limited in its spread more easily than some of the other exanthemata, because the infectious principle, although more tenacious of life, is not so active as that of some other diseases - i.e., its powers of diffusion are weak, and hence aërial infection is not common.

One of the greatest difficulties in the prevention of scarlet fever is the fact that, as a rule, there are no warnings of the coming attack, and on account of its sudden onset, children frequently play about and mix with others, apparently in the best of health, up to a few hours of the appearance of the initial symptoms, and so every opportunity is given for an unlimited extension of the disease.

Another difficulty in the successful prophylaxis of the disease by isolation, is the occurrence of mild cases which are not recognised - cases in which the symptoms are so slight that the child is not seen by the medical man. The diagnosis of cases showing only slight

throat symptoms, or in those where the rash appears in an anomalous manner, or in which it is only of a fleeting character, and where the constitutional symptoms are of the slightest, may be extremely difficult, and it will be the safest and wisest plan to treat the case as one of scarlet fever, and isolate it at home - at any rate, until the diagnosis is absolutely certain - for, although the attack may be very mild, it is quite capable of infecting others, and those who are peculiarly susceptible to the disease, may acquire it in its most malignant form. Great prejudice exists, especially among the poorer classes, to the necessity of the isolation of these doubtful cases, until an absolute diagnosis can be made, and in many instances the child is allowed to mix with other members of the family, or even outsiders, and an epidemic is frequently the result. Of course, in many of the poorer class of houses, it is impossible to give up a room entirely to the use of the patient.

Whenever we see a patient in whom the symptoms suggest an attack of scarlet fever, we should insist upon immediate quarantine, and none of the family (not even the parents) should see him until the diagnosis proves to be wrong; and when the diagnosis is certain, as in the majority of cases it will be after waiting for twenty-four hours, or if we see the patient for the first time when there can be no doubt as to the nature of the illness, removal to an isolation hospital should be recommended.

Many parents will not consent to the removal of their children, and so we are compelled to treat the case at home. In such instances we must insist upon the patient occupying a room as far removed from others as possible, for when no single room can be obtained in a house, the disease is sure to spread. It is better for the sick-room to be situated on the top floor of the house, and an intervening passage, of which the windows can be opened, is also an advantage. When such a room cannot be obtained, the next best is one which does not communicate with any other, and in which the patient and nurse can be kept as far away from the other members of the

family as possible. A sheet wrung out of carbolic lotion (1 in 40), or perchloride of mercury solution (1 in 2,000 or 3,000), should be hung outside the door of the sick-room, and kept constantly moistened. The nurse should occupy an adjacent room, one which communicates with the sick-room is an advantage, and a third room adjoining, which can be used as a common room, would be of great use. The patient's room should have an open fireplace, and two windows which face the south; and not only it, but the nurse's room, and the common room, where one can be set apart, should be stripped of all furniture, carpets, curtains, pictures, books, bed-hangings, ornaments, etc.; in fact, of everything which is not essential to the proper comfort and care of the patient, or of an actual necessity for the nurse. Those things which are allowed to remain should be only those which can be subjected to an efficient disinfection, or of no value, so that they can be destroyed. Strips of old carpet, to be afterwards destroyed by burning, may be put down for comfort, but all things which could harbour the specific poison should be excluded. The bed-stead should be single, made of iron, and should have a woven-wire mattress; in a single bed the patient is more easy to handle, and a hair mattress, not too thin, or it will be hard and uncomfortable, may also be provided. The bedclothes should be of sufficient warmth, and not too heavy (i.e., as light as possible to provide the necessary warmth), and only such should be used as can be boiled or destroyed. A flannel night-gown, buttoned at the wrist, should be worn, and instead of handkerchiefs it is better to use pieces of old linen or rag, or gauze, of appropriate size, and burn them as soon as they have been used. If handkerchiefs have been used they should also be burned. The room should be supplied with a set of dishes, and the necessary nursing utensils for the patient's use, which in no case should be allowed to go outside, but should be washed in the room, or rooms, and a gas, or gasoline stove should be provided, upon which water can be boiled for the preparation of simple articles of food, or for the use of disinfection.

The nurse should occupy a room adjoining that of the patient, should wear a uniform made of linen, or some other suitable material, which can be boiled, and when in the sick-room should wear a cap, to cover the hair; this cap should also be made of material which can be boiled; and it is of the utmost importance that she should not come in contact, either directly or indirectly, with any of the other members of the family.

The medical attendant, before entering the sick-room, should put on a wrapper, made of linen, or some other specially selected material, and should cover his hair with a cap. He should not remain longer with the patient than is absolutely necessary, make no needless examination, and should come in contact with the patient as little as possible. Before leaving he should disinfect his thermometer and stethescope, wash his hands and face in some suitable disinfectant, and spray his clothing, hair, and beard with a 10 per cent. solution of formalin. Cases have been recorded where the infection has been carried from house to house by the medical attendant, and the safest method to prevent this is to make a complete change of clothing, but in most instances this may be impossible, so he should arrange to see the infectious cases last on his daily round, or, at any rate, should remain an hour at least in the open air before visiting other children, or a patient during the puerperium. It is advisable for him not to attend maternity cases, but in country practice, where the physician is frequently singlehanded, this precaution cannot be carried out.

When scarlet fever is present in a household, other children should not be allowed to enter, and the adult members should keep as much to themselves as possible, and avoid society. The children belonging to the household should be kept away from school, and if possible should be sent away from the house at once, and isolated until all danger of their spreading the disease is past. By sending them away we lessen the danger of their spreading the infection to other members of the family, besides allowing greater freedom to those in the house, and better attention

will be given to the patient when he is nursed by members of his own family. When the patient is sent to the isolation hospital, the other children should be kept from school for a week after the room and its belongings have been thoroughly disinfected (i.e., for the maximum incubation period), but when the patient is nursed at home, they should remain away, not only during the whole course of the illness, but for one week after the disinfection.

The closing of the schools during an epidemic of scarlet fever is of the greatest importance, and depends, not only upon the severity and extent of the epidemic, but also upon the locality of the school.

In rural districts closure of the schools is often attended with the best results, for the children frequently come long distances, and the school is often the centre where the children from scattered hamlets meet, and who would not, under other circumstances, be brought into contact with each other. In towns, on the other hand, little is to be gained, as far as isolation is concerned, by closing the schools, for the children, if not at school, will play in the streets together, or mix in each other's houses, - consequently they would be just as liable to spread the infection; but, at the same time, it must be said they would be less liable to impart the infection, than under the condition of bad ventilation and over-crowding, which frequently occur in many schools.

A child may be away from school for a day or so, with what appears to be so trifling an ailment that the parents do not think it necessary to consult a medical man, and may then return to school; or perhaps the disease has been so mild that the child has attended regularly; or, again, perhaps has returned too soon after the illness, and so spread the infection broadcast. To avoid this, in many large cities and towns, physicians are specially appointed to periodically examine all children attending the schools, and when this is thoroughly done, and if there be proper vigilance at home in addition, an epidemic may frequently be eradicated in a very short time.

Von Kerschensteiner ("Vortr. ueber Gesundheitspflege," u.s.w., edited by Dr.Paul Börner, No 10; "Die Verbreitung von Masern, Scharlach, u. Blattern"; "Ein Stück der Schulgesundh." Berlin, Max Pasch, 1883), thinks when a patient is suffering from scarlet fever, the children in such a family may attend school as usual, and the contagion is usually communicable during the stages of invasion and eruption (and not only during the stage of desquamation). Certain prophylactic measures should be taken: He would instruct the teachers in the symptoms which usually precede the disease, and when there was danger of an epidemic occurring, he would recommend the inspector to examine the children daily. As the teachers are in daily contact with the children, and if they have familiarised themselves with the diseases to which children are liable, he thinks they will seldom fail to detect the early symptoms of an acute eruptive disease. Whenever a teacher suspects a child of showing symptoms of scarlet fever, the child is sent home at once, and if no further symptoms appear, is allowed to return to school.

Von Jürgensen (Nothnagel, p. 224) would recommend closing the schools in scarlet fever if the disease appears in severe, virulent, and epidemic form, as the danger to its victims is so great.

PERIOD OF QUARANTINE.

The earliest time a patient should be allowed to be out of quarantine is six or seven weeks, and then only if all desquamation has ceased, and if there be no discharge from the ears and nose. This rule will also apply to those mild cases in which the desquamation has been slight, or not at all noticeable. According to Wehmer (Enzyklopädisches Handbuch der Schulhygiene, 1904, p. 542), the length of time during which children are excluded from school is as follows:-

Six weeks in most German states, forty days in France and Belgium, and eight weeks in Denmark.

DISINFECTION.

It is extremely important, even in the mildest forms of the disease, to exercise great care in the disposal of the excreta and secretions. Chloride of lime, - sixteen ounces to three gallons of water, - may be employed as a general disinfectant. It should be used freely about sink-drains, refuse heaps, sewers, privies, stables, etc.; and, although its odour may be objectionable to some persons, it is one of the most efficient and inexpensive disinfectants and germicides we possess for general use. It is necessary it should come in direct contact by wetting everything required to be disinfected, and must be used very freely. It may be placed in saucers in the sick-room, and sheets and other clothing used by the patient, may be immersed in a bucket, containing one gallon of this solution diluted with ten gallons of water, and allowed to remain for two hours at least, or longer until ready to be taken to the laundry. It is necessary to obtain fresh chloride of lime; and it possesses two important qualities - viz., it is not poisonous, and does not injure white clothing, and it may also be used to wash the hands after touching infected articles, excreta, etc., care being taken to anoint the hands with vaseline, lanoline, or olive oil afterwards.

The urine and faeces should be disinfected by the addition of, either carbolic acid (1 to 20), perchloride of mercury (1 in 500), the solution of chloride of lime as above, or a solution composed of perchloride of mercury, half an ounce, hydrochloric acid, one ounce, and water, three gallons. The solution in all cases should be placed in the bed-pan before, as well as after, use. When a water-carriage system is in vogue, the urine and faeces may, after thorough disinfection as above, be emptied into the closet, which should also be thoroughly disinfected and flushed; but if there is no water-closet, they should be buried four feet in the earth, at least thirty or forty yards away from any running stream or well. Discharges from the ear should be received into pieces of

old linen, gauze, or absorbent cotton wool, and burned at once, and the secretions from the nose should be removed by pieces of soft linen or gauze, which should be immediately destroyed. The discharges from the mouth and nose, if not very abundant, may be dealt with in the same manner, but if they are at all copious, and especially in the severer forms of the disease, they should be received into an expectoration cup, containing some suitable disinfectant - e.g., solution of chloride of lime, carbolic acid (1 to 30 or 40), or izal (a 10 per cent. solution).

Dirty and soiled bed linen, towels, etc., when removed from the patient should be at once placed in some disinfectant solution - e.g., perchloride of mercury (1 in 1,000), carbolic acid (1 to 30 or 40), and should remain in this solution for at least two or three hours, and when taken from the sick-room, should be immediately boiled, and laundered separately.

Food intended for the patient should be left outside the sick-room door, within easy reach of the nurse, and a special set of glasses, dishes, cups and utensils should be kept in the patient's room, and before being removed from it, should be thoroughly disinfected, and if possible boiled. All remnants of food should be burned, and the liquids remaining unconsumed should be disinfected and disposed of with the urine, and all dressings, poultices, etc., should be burned. It is imperative that no letters should be allowed to be sent from the sick room.

When the patient has completely recovered, and at the end of the period of quarantine, he should have a hot bath with soap, after which he should be sprayed with a solution of perchloride of mercury (1 in 2,000), which in turn is sponged off with sterilised water. Special attention should be given to the scalp, and the ears should be syringed with perchloride solution (1 in 8,000), and the mouth cleansed, and the nose sprayed with a saturated solution of boracic acid. He is then covered

with a clean towel, taken into another room, where clean clothes, which have not been in contact with any infected articles, should be ready for him, after which he may be allowed to join the other members of the family, though it would be better for him to take a walk before doing so, - weather permitting, - and it is necessary to add that he should occupy a separate bedroom for at least ten days or a fortnight.

The sick-room and its contents, and also the nurse's room with its contents, should be at once thoroughly disinfected. The clothes of the patient, and those of the nurse, the bed-linen, and the body-linen, should be placed in a solution of perchloride of mercury (1 in 1,000), or carbolic acid (1 in 20), or izal (10 per cent.), or the solution of chloride of lime aforesaid, and allowed to remain for several hours, then removed, rinsed in cold water, and boiled before washing. The bedding should, if possible, be disinfected in the disinfecting apparatus at the isolation hospital, or burned, and the pieces of carpet, which have been allowed to remain in the sick-room, should be subjected to heat in the same manner.

The room should be thoroughly fumigated; the chimney should be closed, and the room made as air-tight as possible, and the furniture, and other articles remaining in the room, should be spread out so as to allow of the free access of the disinfectant. Boxes should be opened, pockets turned inside out, and all surfaces exposed both inside and out - e.g., furs, silks, carpets, etc., should be hung in the room during disinfection. Sulphur is placed upon a broad shovel or iron pan which is supported on bricks, or upon two pokers placed across an iron vessel containing water, and is ignited by live coals, or after alcohol has been poured upon it, and lighted by a match. (It is necessary to have water underneath the plate containing the sulphur to obviate the danger of fire.) As soon as the sulphur burns, the door should be closed, and made air-tight, and the room should not be opened for twenty-four hours. At the end of this time, the windows and doors should be opened, and plenty of air and

sunlight admitted, for twenty-four hours at the least, before cleaning begins. It is necessary to allow three pounds of sulphur for every 1,000 cubic feet of air-space, but sulphur dioxide is useless for disinfecting mattresses, clothes, and similar articles.

Formic aldehyde (formalin) is a most efficacious disinfectant, and is frequently used instead of sulphur. It may be used by means of a spray, but the most convenient form is to use the formalin tablets and the alformant lamp. To get the best results, it is necessary to use one tablet for every fifty cubic feet of air-space.

Sulphurous acid is another disinfectant, but is not so useful as either sulphur or formalin.

The furniture, bedstead, indiarubber goods, crockery, ware, and large metal articles, should be thoroughly washed with a solution of carbolic acid (1 to 40) or perchloride of mercury (1 in 2,000), or izal (10 per cent.). Small metal articles should be boiled, or submitted to dry heat; leather goods should be disinfected in the same manner (dry heat), but all toys, books, and articles of little value in the room should be burned.

If the walls of the room are papered, the paper should be soaked in a solution of carbolic acid (1 in 30 or 40), and then stripped off, or rubbed with dough, or bread crumb, to which a solution of corrosive sublimate has been added. The paper should be burned, and it is of importance to collect the masses of dough, or the bread crumbs which fall off during the process of rubbing, and burn them also. The ceiling is treated in the same way, and then scrubbed with a solution of perchloride of mercury or carbolic acid, and the floor should be thoroughly scrubbed with the perchloride solution, and soap and water, and if possible, either freshly painted or varnished. If the walls are painted, the same process of rubbing is carried out as when papered, followed by a new coat of paint; the ceiling is whitewashed, and in those rooms where the walls were papered, they are now repapered. After all this has been done, it is wisest to

open all the windows, and lock the doors, and not allow the room to be tenanted again for at least one week, and longer if possible.

It is equally important to treat the nurse's room in the same manner, and when the patient is disinfected, the nurse should have a bath, thoroughly cleanse the hands, pay careful attention to the hair (wash the scalp in perchloride solution or alcohol), and change her clothes.

Certain authorities - e.g., Vogl (loc. cit., p.984) and E. Hagenbach-Burkhard (Jahr. f. Kinderh., N.F., Bd.24, S. 111-115; Compare also Emil Koch - loc. cit., p. 35) say that disinfection, even when carried out as carefully and thoroughly as possible, according to our present methods, does not render the room absolutely sterile from the scarlatinal toxine.

When the patient dies, the corpse should be wrapped in a sheet wrung out of izal solution (10 per cent) carbolic acid (1 to 20), perchloride of mercury (1 in 500), chloride of lime (see before), or a solution of sulphate of zinc, 8 ounces, common salt, 4 ounces, and water, 1 gallon. The interment should take place as quickly as possible, and should not be public.

ISOLATION HOSPITALS.

During the last few years there has been a great amount of discussion concerning the efficacy of isolation hospitals in the treatment of scarlet fever, and very diverse views have been expressed upon the subject. Some consider they limit the spread of the disease; others hold that epidemics are kept going by the so-called "return cases", whilst mild cases admitted into a hospital, run the risk of being infected by the more serious cases already undergoing treatment there. Many think that the failure of the system is due to bad and faulty administration; and there is no doubt that cases treated at home may be a source of infection, for the

isolation practised in these cases is much inferior to hospital isolation. Sometimes mild cases are not treated by a physician, - the relatives, in fact, trying to hide the disease, and not notifying it to the health authorities; or, again, cases in which the disease has not been diagnosed are of frequent occurrence, and are a fruitful source for the infection of others.

In the Section of State Medicine, at the meeting of the British Medical Association, held at Leicester, in 1905 (Brit. Med. Jour., Sept. 16, 1905, p. 630), a discussion took place upon Hospital Isolation, and some speakers maintained that it has not only failed to reduce the occurrence and the mortality of the disease, but also, it did not contribute in any way to the presence of the milder forms of the infection. Dr Wilson, Medical Officer of Health for Mid-Warwickshire, thought the mild cases, did as well, or even better, when treated at home, and he would reserve the hospitals for cases occurring in workshops, dairies, or milk shops, or for servants who have contracted the disease, and for the more severe cases. Dr. Waddy, of Sheffield, maintained that during the last four years in Sheffield, the houses from which patients were removed to hospital, were worse off in respect to the occurrence of scarlet fever than those in which patients were treated at home, and he thought that hospital isolation would be, in the future, the last resort for those cases which could not be treated at home. Many thought that aggregation was not right, and suggested that each case should be treated apart from others - i.e., true isolation; and as regards the spreading of the disease by the so-called "return cases", some speakers considered their importance had been greatly exaggerated.

According to Nothnagel (p. 613), as far as is known, there has been no history of contagion from a discharged patient in the Hospital for Scarlet Fever and Diphtheria Patients, New York (Annual Report, 1901).

In the Lancet for March 12, 1904, Lauder, the Medical Officer of Health for Southampton, gives an

account of the methods carried out at the isolation hospital in that town. He begins by saying that, as a result of observation, he firmly believes that "return cases" are "attributable not to the peeling condition, as is generally contended, but mainly to undetected discharges from the respiratory passages and ears in those who have left the hospital". He dwells upon the necessity for more classification and more segregation, and adds: "my observations, extending over a wide range of cases, have led me to regard the upper respiratory passages, particularly the naso-pharynx and the pharyngeal and faucial tonsils, as responsible for the reception and propagation of the infection".

According to him, prolonged stay in the hospital, or the absence of desquamation, does not assist in preventing "return cases", and he regards the upper respiratory tract - i.e., the naso-pharynx, as being the focus of infection. In proof of this he makes the following clinical observations:

"1. The class - young persons - which is so susceptible to scarlet fever is also most subject to abnormal conditions of the tissues of the naso-pharynx and tonsillar region. These tissues, consisting as they do of a large amount of lymphoid tissues with involutions of the mucous membrane, offer a most favourable nidus.

"2. The period of incubation is short, and the changes in the mucous membrane of the upper respiratory tract appear early.

"3. Evidence of infection following operation on the upper respiratory tract.

"4. The constitutional symptoms and fever are, as a rule, in proportion to the condition of the respiratory passage.

"5. The majority of "return cases" is associated with discharges coming from the upper respiratory passages and ears.

"6. Enlarged glands are in proportion to the crowding of the ward and the introduction of fresh acute cases."

After stating that, up to February 1903, the treatment he adopted was the usual one of treating all cases in the general wards, and only discharging those who had finished desquamating, and who had no discharges from the ears, or nose, or no other complication, after the usual bath, he says that owing to fresh cases being admitted into the general wards from time to time, complications were both frequent and obstinate.

Since February 1903, he has adopted the following treatment: by keeping the mild and convalescent cases apart from the acute, or those who are suffering from discharges, they are guarded against reinfection, and "their respiratory passages are assisted to free themselves naturally from the organisms of infection". His method is as follows: Cases are brought to the hospital from only one house at a time, and are examined in the ambulance by the resident medical officer, and a swab taken from the fauces, for the purpose of bacteriological examination. If the case be doubtful, it is sent to the observation ward, and is either sent home or detained when the diagnosis is clear. This ward is disinfected at once after the removal of the patient. Cases of "undoubted scarlet fever" are then sent to the "acute room", and kept there until the acute stage is passed, and diphtheria is excluded by the bacteriological examination of the swab. They are then sent to a general ward, where the recent cases are kept apart from the convalescent. These precautions are taken even in the mildest cases, and if at any time any patients showed complications, such as enlarged tonsils, discharges from the ears, or nose, enlarged glands, etc., they are removed to a pavilion reserved for such cases. Those patients showing no complications, at the end of the third week, are sent to the out-bathing station, bathed, and then transferred to another pavilion, which has been previously

disinfected. Here they are kept apart from all other patients for a week, and after the evening bath, the nose, ears, and the throat, are carefully douched with a disinfectant, and at the end of this week (i.e., the fourth week) they are discharged from the hospital, whether desquamation has ceased or not, after passing through the out-bathing station. The general wards were disinfected at least once a month, or oftener if necessary. As a result he states that "these methods have not only comparatively freed us from the occurrence of albuminuria, enlarged glands, discharges from the nose and ears, etc., in the patients, but have reduced the duration of fever, and the period during which they had to be kept in bed, and left us during the year without a single case of post-scarlatinal diphtheria or relapse. Further benefit would, I believe, result from the complete and continued separation of each individual case".

He also gives a number of tables in which we find that the average period in the hospital was reduced fourteen days, that the percentage of "return cases" was 2.15 (in the previous year it was 4.27), and he concludes that the peeling per se is not infectious, as he discharged 204 cases in a peeling condition, and yet only 2 "return cases" were traced to them. He considers a nasal discharge to be the most infectious condition.

Of the 325 cases discharged -

33 had no peeling or complications and caused no "return cases".

204 were peeling, but no complications. These were returned to 180 houses, containing 744 persons who had never had scarlet fever, and only 2 "return cases" were traced to them.

88 were complicated, and 5 of these, although showing no peeling, but all having nasal or aural discharges, caused other cases. In some of them the discharge returned after leaving the hospital.

Millard (Brit. Med. Jour. Sept.3, 1898) reported that 158 out of 4810 cases discharged from the hospital after recovery from scarlet fever, were apparently the carriers of infection to 173 new cases. In his opinion these discharged patients were infectious through the skin, nasal mucus, otorrhoeal discharges, etc., in spite of every precaution being taken before they left the hospital. The interval which elapsed between the discharge of the old cases, and admission of new ones averaged about eight weeks.

He also discharged 190 cases before the desquamation had ceased, and only five of these caused other cases. Of these five, four had a nasal discharge, and one a running sore behind the ear.

Aaser, of Christiania (Nord. med. Arch., 1903; abt. ii, Anhang 51) reports 3800 cases of scarlet fever occurring during the years 1895 to 1902, and records 79 in which the disease was contracted from patients who had been recently discharged from the hospital.

Many authorities agree with Lauder that the disease is increased in virulence, complications are much more frequent, and "return cases" occur oftener, when the patients are aggregated together in a general ward, than when treated separately. Newsholme (Lancet, June 18, 1904, p. 1724) read a paper before the Royal Medical and Chirurgical Society of London, in which he maintains that "return cases" are comparatively rare, and "do not seriously invalidate the utility of isolation hospitals". He thinks they occur, as a rule, though not always, in connection with nasal or aural discharges, and may occur in connection with patients treated at home; and he cannot accept the statistics which have been published, as proving that "return cases" belong essentially to hospitals. He considers that patients, treated both at home and in hospitals, should be subjected to post-isolation supervision, and that frequently catarrh or other circumstances may light up a dormant infection. He also states that nasal discharge is most frequently associated

with protracted infection, and if not present when the patient was first isolated, appeared very soon afterwards.

In the Lancet of July 1st, 1905 (p. 41), there appears a note upon the annual report of Dr. Egerton H. Williams of the infectious diseases hospitals of Sheffield. Out of 1981 cases discharged from the hospital, 70 were associated with "return cases". Upon investigation, it was found possible to eliminate 24 of them, as other sources of infection could be traced, and of the remainder, 19 were regarded as "improbable return" cases, and in the other 27 no source of infection could be traced, - consequently they were true "return cases". Of the 70 cases which were suspected of causing "return cases", 13 had otorrhoea, 14 had a nasal discharge, 5 had a sore mouth, or nose, and the remainder showed no abnormal condition. It is the custom in the Sheffield hospitals to isolate patients with discharging ears and nose, and if the discharge does not cease whilst in the hospital, instructions are given to the parents as to treatment on their return home. When discharged from hospital, all cases, with the exception of the 13 with otorrhoea, were perfectly healthy. During 1904, 303 cases of aural or nasal discharge were isolated, and 112 were sent home cured. Of the remaining 191, only the 13 above mentioned were suspected of being the cause of "return cases", and on further investigation 7 were proved not to have been so. The average stay in the hospital of the 70 cases was 54.3 days.

The importance of the occurrence of "return cases" is very great, as an action was brought against the medical officer of the Liverpool Hospital for discharging a patient who, it was alleged, gave the disease to his brothers and sisters.

There is not the slightest doubt it is much better to keep the acute cases, and those showing complications, apart from those who are convalescent, and no one will deny that the discharges from the nose and ears, and running sores, are infectious; but as yet it has not been

satisfactorily proved that the specific scarlatinal agent is not present in the desquamation; and, whilst this is so, it is far better to err on the safer side, and not to discharge any case in which desquamation has not ceased.

In the Swallownest Hospital, as far as possible we keep the acute cases from the convalescent, but are handicapped by the lack of accomodation. When the hospital was first built the different authorities did not expect so much infectious disease being present in the district, and although the hospital has only been in use about eighteen months, it is already necessary to consider the provision of further accomodation. I discharge no case under seven weeks' stay in the hospital, not even if desquamation has ceased some time previously. If, at the end of that time, peeling is present, I detain them until the skin is clear, and if any case shows otorrhoea or rhinorrhoea, it is not discharged until one week after the discharge has ceased. If at the end of fourteen weeks the discharge still persists, the patient is allowed to return home, and I write the medical attendant, asking him to see that some suitable antiseptic lotion is used. All cases are warned to sleep in a separate room for two weeks after returning home.

Out of 200 cases discharged from hospital, we had no "return cases", although 2 were supposed to be so. In 1 the infection was clearly traced to some clothing left at home, and which had not been disinfected; and with regard to the second, the facts are as follows: A patient was discharged on the afternoon of Wednesday, and returned home to a house, next door to which 2 cases had been removed to the hospital on the previous day. On the following Friday evening, her brother developed a scarlatinal rash, and the authorities thought he might have caught the infection from the sister. If this were so, the period of incubation must only have been twenty-four hours, and the probability is that he was infected by the cases which occurred next door.

PROPHYLAXIS BY DRUGS.

Several drugs have been recommended for prophylactic use internally, but up to the present none have been found to be efficacious. Belladonna has been frequently used, its action being based upon the homeopathic principle, and extolled by Hahnemann (R. Köhler, "Handb. der Spec. Therapie", Tubingen, H. Laupp, 1867, Bd. 1, 3rd edition, S. 87). Biniodide of mercury and oil of eucalyptus have also been recommended (O. Vierordort, "Behand". des Scharlachs", in Pentzoldt. Stintzing's "handbuch", Bd. 1, S. 193), and Speransky ("Arch. f. Kinderh.", xxiv, 423) administered Fowler's solution to twelve children who had been exposed to scarlet fever. He gave it in one or two minim doses, twice daily, and although these children continued to mix with infected cases, they did not contract the disease. The great difficulty in these cases is the fact that there is no evidence to show that these children would have contracted the disease if the drug had not been administered.

MANAGEMENT OF THE ATTACK.

NURSING.

The patient should be placed in a room which has a plentiful supply of fresh air, and plenty of light. It should be thoroughly ventilated, but at the same time an adequate temperature must be maintained. For proper ventilation it is essential that the room should have an open fire-place, and at any rate during the milder seasons of the year, the top-sashes of the windows should be kept open day and night; and, if practicable, to a proportionate extent during the winter months. If there be any danger of draughts when the windows are open, the patient must be protected by screens, arranged in a suitable manner, although they should not be used unless absolutely necessary. If it be possible to give up two rooms, with a communicating door, to the patient, the

ventilation is much more easily arranged, as it will be possible to have the windows of the adjacent room open even in the coldest weather, whilst the communicating door will regulate the draughts. The bed should be placed so as to admit of the freest admission of the outside air, and the air of the sick-room should be kept as dry as possible, the temperature at the same time being maintained at between 56° to 60°F. (Forchheimer says the temperature should be from 65° to 70°F.,) Plenty of daylight should be allowed to enter the room, but the eyes of the patient should be screened from any glare, and artificial light should be reduced to a minimum. The patient, if an adult, should "settle down" by 8 p.m., - if a child, by 6 p.m. It is necessary for the patient to be kept in bed, even if the attack be of the mildest type, as this ensures him being kept in an equable temperature, and consequently there is less work thrown on the kidneys; whereas, if he be allowed to be up, the temperature will be constantly changing, and there will be a great danger of renal complications occurring. The patient should wear a flannel night-gown (some would allow one of linen during the first week, and afterwards flannel), and when up should wear flannel or woollen underclothing. The bed-clothes should be as light as is possible to ensure protection against any sudden change of temperature. It is of more importance to have a warm temperature during the stage of convalescence than in the acute stage of the illness.

J. Lewis Smith recommends, during the whole course of the illness, that a saucepan of hot water be kept in the room upon a gas or oil stove. To a quart of hot water he adds two tablespoonfuls of the following antiseptic fluid, so that a constant antiseptic vapour is diffused throughout the apartment:

℞,

Acidi Carbolici
Olei Eucalypti āā ℥ i
Spiritus Terebinthinae ad ℥ viii
Misce.

Sig.- Two tablespoonfuls to be added
to a quart of hot water.

The usual rule is to keep the patient in bed for three weeks, during which time his urine is examined daily, and if at the end of this period no complications have occurred, he may be allowed up for two or three hours. For the next three or four days, he will remain up for a longer time, then be allowed to move from room to room for the next three or four days, after then, if the weather be suitable (i.e., dry and not too cold), and if suitably clad, he may go out for a walk. If the weather be at all damp or "muggy", and especially if the patient does not move about, renal or glandular complications are apt to occur. Some physicians will allow the patient to be up in ten days or a fortnight, provided he takes care to avoid all undue exertion, and takes precautions to avoid a chill, whilst others will allow them to be up in ten days after the temperature has become normal. Most authorities consider it wiser to keep children in bed for three weeks, especially as complications are very prone to develop during this period.

When the patient is dismissed from quarantine, a change of air, especially to the seaside, will be of great benefit.

Particular attention should be paid to the skin throughout the whole illness. Whilst the temperature is above normal, the patient should have a tepid-sponge twice a day, precautions being taken to avoid unnecessary exposure. By doing this the action of the skin is encouraged, its tension is decreased, the temperature is lowered, and the patient feels very much more comfortable; and when given immediately before the time for "settling down", it has a soothing effect, frequently inducing quiet and refreshing sleep. Some writers advocate the daily washing of the surface of the body with soap and water, at any rate down to the hips, even during the time the temperature is raised. Warm baths should be given daily, if possible, when the temperature has fallen to the normal, to facilitate the peeling, and after the

patient is thoroughly dried, and when desquamation has commenced, he should be anointed from head to foot with lanolin, cacoa-butter, boracic acid ointment, or vaseline, to which some suitable antiseptic has been added - e.g., eucalyptus, - and put to bed again.

Carbolic acid, in the form of carbolic oil or carbolic ointment, is sometimes recommended, but it cannot be used of sufficient strength to have any antiseptic effect, without producing toxic symptoms.

When the desquamation is attended with much itching, Forchheimer recommends the addition of menthol (1 to 2 per cent.) to the ointment mentioned below. Vaseline may sometimes cause much irritation of the skin in young children; in such cases the following ointment will be found of service:

R,
Olei Olivae
vel Olei Amygdalae ℥ i
Vaselini
Lanolini ãã q.s. ad ℥ ii
Misce, ut ft. unguentum.
Sig.-To be applied as directed.

In many isolation hospitals inunction is not used at all, the desquamation being aided by baths alone.

Curgenven (Med. Mag., Lond., iv, 470) recommends eucalyptus inunction in scarlet fever, and maintains by doing so the death-rate is very low, the number of complications fewer in proportion, the duration of the fever less, and the disinfecting power great, as shown by failure to spread to other individuals.

DIET.

The question of diet in scarlet fever has given rise to much controversy, and divers opinions have been expressed upon the subject. Some - e.g., Jaccoud, Moizzard (loc. cit., p. 158), insist upon the importance

of an absolutely milk diet, because it aids diuresis, is easily digested, and as it produces the fewest toxines, the intestinal tract is more or less sterile, - consequently there is less danger of auto-infection. There is no doubt that this treatment is the more rational one, as it not only supplies enough nourishment for the patient i.e., it is a complete food, but throws the least amount of work upon the kidneys, and aids in the elimination of the poison. Many writers maintain that by keeping the patient upon an absolutely milk diet during the early weeks of the disease, the occurrence of nephritis is considerably diminished. The milk should be previously boiled, or raised to the necessary temperature for sterilisation. It is best to be given diluted, either with boiled water, or some of the effervescent alkaline waters, or barley water - equal quantities of milk and Vichy or Vals water, or one part of milk to two of Apollinaris or soda water, or equal quantities of milk and boiled water with ten grains each of sodium bicarbonate and common salt to each pint. For an adult we should give two ounces of milk with two of alkaline water every hour.

The patient should be allowed plenty of cold water (which has been boiled), as it helps to wash out the kidneys, and there is no reason why, in uncomplicated cases, ripe fruit should not be taken, especially after the first week, as it is both wholesome and refreshing. For the thirst other refreshing drinks may be allowed - e.g., lemon juice with soda water, and sweetened, lemonade, or imperial drink, which is made by pouring a pint of boiling water on a large teaspoonful of cream of tartar, a little sugar, and half a sliced lemon. It should be strained when cold. It is of the utmost importance that the urine should be examined daily, and at the end of the first week, according to the age and general condition of the patient, and even when the temperature has not fallen to the normal, many will allow, in addition to the milk, a little strained soup, beef-tea, mutton-broth, or chicken-broth, calves'

foot jelly, and beaten up eggs. Towards the end of the second or the beginning of the third week, they allow a more solid diet, bread and butter, custards, milk puddings, junket, oatmeal gruel, lightly boiled eggs, soft toast, fish, poultry, and butcher's meat.

Forchheimer (loc. cit., p. 95) gives during the first week "a diet limited solely by the digestibility of the various articles. Such diet is to be given as would ordinarily be given to a patient in bed; therefore not too much meat, not too many carbohydrates". During the second week of the illness, he insists on an absolutely milk diet, and gives as much pure water as possible, either distilled, aërated, or mineral, and he keeps the patient on milk diet until the end of the fourth week, when carbohydrates are allowed, and if these do no harm, an ordinary diet is soon ordered.

Those who allow nitrogenous food during the whole course of the illness, maintain their results are no worse than those obtained by the advocates of an absolutely milk diet; and Caiger thinks it does no harm, and says: "There is no evidence that nephritis has ever been caused by the administration of a diet containing a moderate amount of nitrogenous food." According to him, the best criterion of its advisability is the patient's desire himself for solid food, and as soon as he is able to swallow it without discomfort it may be given.

In refractory children, and in those cases where the patient is delirious and restless, and also when the throat is very swollen, inflamed, and ulcerated, especially when in addition there is enlargement and tenderness of the glands in the submaxillary region, swallowing may be so very painful that no nourishment can be taken at all, or only in such a small amount as to be totally inadequate to support the patient's strength. In these cases (which more frequently occur in children) it is necessary to give the milk, etc., in small quantities at short intervals, and those who are in favour of nitrogenous food in the early stages, would

*

rely upon egg-albumen, concentrated beef-tea, raw beef-juice, or some of the many meat extracts which are now so much in vogue. In extreme cases it will be necessary to pass a nasal tube, or even to feed entirely by the rectum.

It is my custom to keep every scarlatinal patient on an absolutely milk diet for the first ten days of the illness. Plenty of water (sterilised), aërated or mineral, is allowed, and also fruit. If there are no complications, and the temperature is normal at that time, milk puddings, and bread, and toast, are allowed, followed by fish at the end of the second week. Chicken is permitted during the third week in favourable cases, and if all goes well, when he is up on the twenty-second day, mutton and eggs are added to the dietary. At the end of the fourth week he is put on an ordinary diet.

MEDICAL TREATMENT.

SERUMTHERAPY.

So long as the specific micro-organism remains undiscovered, the treatment of scarlet fever must be purely symptomatic. Of recent years many observers have made researches into serumtherapy, but the results have not been very encouraging. Experiments in this direction have been made by Kelaïdites, Weissbecker, and by Heubner and Blumenthal. The latter (Berl. klin. Woch., No. 31, 1897, pp. 671 et seq.) obtained serum from the blood of convalescent cases. They took it by venesection from four to twenty-one days after the fever had disappeared, and their mode of procedure was as follows: 100 - 150 c.c. of blood are immediately diluted with an equal quantity of sterile normal salt solution, 1 per cent. of chloroform is added, and after being shaken up, the whole is allowed to stand for twenty-four hours. After being pressed through sterile linen and filtered through a Berkfeld-Nordmeyer apparatus, a clear, dark-red fluid is obtained,

which is sterile, and remains so for at least ten months. They injected 20 - 40 c.c. of this serum into thirteen cases of scarlet fever, twelve of them on the following days of the disease: two cases on the second day; four cases on the third day; three cases on the fourth day; two cases on the fifth day; and one on the sixth. Of these, one case could not be considered, as the patient developed puerperal pyaemia and parametritis; another showed no reaction, although 40 c.c. of serum were injected; in eight cases the results were not well marked, and in the other three a marked reaction, with most beneficial results, was noticed. The temperature began to fall, on an average, on the sixth or seventh day, never later; normal temperature was found three times on the fifth day of the disease, twice on the sixth, seventh, eighth, and ninth days each, and once on the tenth day, never later. When lysis took place after the injection, it occurred seven times upon the first, and three times on the second day of the injection, never later. The exanthem continued to develop in six cases after the injection, which in some cases was followed by a slight rise in temperature. The injections gave rise to no serious complications, and joint-pains were noticed in three cases only.

Marmoreck's antistreptococcic serum has also been used, especially by Forchheimer, who at one time treated all his cases of scarlet fever with it. As a result of his observations he has come to the conclusion that the course of the disease is not modified in any way by this serum; and whilst those malignant cases, in which the dose of poison is so excessive, are not modified, he has seen cases which have been complicated by streptococcic angina, affected in a most remarkable manner. He mentions one case in particular, of this form of the disease, which recovered after the injection of Marmoreck's antistreptococcic serum, although at one time it appeared to be hopeless.

Baginsky (Berl. klin. Woch., 1896, No. 33, pp.340 et seq.) reports a series of 48 cases of scarlet fever

treated with Marmoreck's antistreptococcic serum, and of these 7 died, - a mortality of 14.6 per cent.; and E.M. Landis (Jour. Amer. Med. Assoc., April 8, 1899) mentions a severe case which ended in recovery after antistreptococcic serum had been used.

J. von Bokay (Deut. med. Woch., 1904, xxx, No. 1), out of 46 cases of scarlet fever, selected 12 of the severest, and to these he gave from 100 to 200 c.c. of antistreptococcic serum, - with the result that 10 were cured. He noticed there was a great improvement of the general condition of the patient within twenty-four hours after injection; delirium soon ceased, the cerebral symptoms disappeared rapidly, and the temperature became lower, whilst at the same time the pulse-rate decreased, and its quality improved. Nephritis occurred in two cases, both of which recovered; in one it was severe, inthe other of a mild type. Otitis media occurred in a few cases, but was never severe; no collapse was noted in any of the cases, joint pains were noticed in a few ~~of the cases~~, but no bad effects resulted from the use of the serum, except in one case when albuminuria occurred, but lasted only a very short time. Serum rashes were noticed in seven cases, - on the sixth, seventh, eighth, ninth, sixteenth days, and in one after four weeks.

Heubner (Berl. klin. Woch., 1904, xli, p. 372) selected twenty cases of scarlet fever, and used three different kinds of serum - viz.: Aronson's, - obtained from horses immunised with human streptococci, made especially virulent by repeated passages through animals; Moser's, - obtained from horses injected directly with streptococci isolated from cases of scarlet fever; and Menger's, - obtained from horses injected with streptococci isolated from cases of rheumatism. He states that in no case did he obtain any beneficial result.

F.P.Mackie (Lancet, Feb.20, 1904) has studied 950 cases of scarlet fever, and is of the opinion that antistreptococcic serum is of the greatest value in cases showing severe throat symptoms and marked toxaemia. It

should be given early, without waiting for a bacteriological examination of the throat, and if no effect on the temperature follows the first or second injection, the administration should be suspended. He says the serum does no harm, but is liable to produce an urticario-erythematous rash.

T. Escherich (Wein. klin. Woch., 1903, No. 23) has used Moser's serum in 112 cases of scarlet fever. No deaths occurred when the serum was injected on the first or second day of the disease. In 27 cases injected on the third day, the mortality was 7.4 per cent. In 23 cases injected on the fourth day, the mortality was 17.4 per cent. In 20 cases injected on the fifth day, the mortality was 30 per cent., and in the remaining cases the mortality ranged from 33 to 50 per cent. Escherich thinks that the remedy is indicated in severe cases, and that it should be given early and in a large dose.

Hektoen (Jour. Amer. Med. Assoc., 1903, p. 685) states that streptococci are rarely found in severe or fatal cases of scarlet fever in the first two or three days. If this be true, it is difficult to see how the antistreptococcic serum could do any good.

In 1896, Josias, of the Trousseau Hospital, gave the results of his experience with Marmoreck's serum. He had two series of cases, in one of which the serum was used, and it appeared to have no better result than the other series, which were placed on a milk diet, and where the throat was specially attended (antiseptic lavage).

Stickler (Trans. Med. Assoc. New Jersey, 1897) inoculated children with mucus from the throats of recent cases of scarlet fever. He injected subcutaneously and hoped to produce a mild form of the disease, but found the type of disease so produced, was too severe to warrant such attempts being made to secure immunity. He found, however, that the secretions of the mouth and pharynx at the outbreak of the disease are highly virulent. Hardly any incubation period is present in fever thus

produced, as the temperature rises within two hours, and the rash appears in most cases within the first twenty-four hours.

Roger ("Die Therapie der Gegenwart", 1900, p. 252) relates a case in which he applied the blood-serum of convalescents as a specific in scarlet fever. The patient, who was in the second day of the disease, was comatose, and did not improve under hydrotherapy and saline infusions; and, as the case was apparently hopeless, a serum was rapidly prepared from the blood of a convalescent from scarlet fever. The patient himself was first bled, and then 80 c.c. (2.7 fl.oz.)of the convalescent serum was injected into a vein. Five hours later there was an improvement in the patient's condition; although the outlook was not very promising, the cool baths were resumed, with good effect, and, on the next day, the unfavourable symptoms had disappeared, and the patient made a good recovery.

SYMPTOMATIC TREATMENT.

In the mild form of scarlet fever it is usual to begin by ordering a mild aperient - e.g., a mercurial-calomel, or one or two grains of gray powder in combination with Gregory's powder, or compound liquorice powder, confection of senna or sulphur, or a saline aperient, such as the citrate of magnesia. The bowels should act daily, and if necessary we should repeat one of the above-mentioned purgatives, or in the case of children, we may order a glycerine enema. In patients who are allowed to get up, a glass of cold water, taken first thing in the morning, will frequently be found sufficient. A simple febrifuge mixture should be prescribed; the one I prefer is -

R,

Potassii Citratis	gr.	xl
Liquoris Ammonii Acetatis	℥	i
Spiritus Aetheris Nitrosi	ʒ	iii
Syrupi Aurantii		

vel Syrupi Limonis ʒ iv
Aquae ad ʒ iv
Solve et misce ut fiat mistura.
Sig.- Two teaspoonfuls to be taken every four hours for a child of three years of age.

Instead of the citrate of potash, we may prescribe the nitrate, or chlorate, or bitartrate ~~of potash~~. Some - e.g., Moizzard (loc. cit., p. 156) prescribe a solution of the acetate of ammonium for the first few days, and discontinue it on the full development of the rash. When the pulse is bounding and of high tension, tincture of aconite (one-quarter to one minim according to age) may be ordered, and its effects carefully noted; though it is not wise to continue it after the second day, or perhaps earlier. Others prescribe the tincture of the perchloride of iron, frequently combining it with dilute hydrochloric acid - e.g.;

R,
Tincturae Ferri Perchloridi ʒ iss
Acidi Hydrochlorici Diluti ʒ i
Syrupi ʒ iv
Aquae ad ʒ iv
Misce ut fiat mistura.
Sig.-One teaspoonful to be taken every four hours for a child of two years of age.

Dukes has found the biniodide of mercury efficacious, not only in arresting fever, but in minimising the desquamation, and reducing the duration of the illness. Some have used the sulphocarbolates, and hyposulphites with advantage. Chloral has been given througout the attack by certain American physicians; and digitalis also has its advocates.

Urotropin Treatment. - Widowitz (Wien. med. Woch., Oct. 1, 1903) has recommended the administration of urotropin in scarlet fever with the intention of preventing the occurrence of nephritis.

It was supposed (but later researches have shown it is not so) that the antiseptic properties of urotropin are due to its excretion by the kidneys in the urine as formaldehyde. (How it acts is at present unknown). He prescribed it in doses of three-quarters to seven and one-half grains, according to the age of the patient, three times daily during the first three days of the illness, after which time it was discontinued until the beginning of the third week, when it was given for a second three days. According to Widowitz, nephritis is a complication of 16 to 90 per cent. of all cases; but, according to the statistics of the Metropolitan Asylums Board, out of 14,889 cases of scarlet fever treated in their hospitals during the year 1902, the nephritis percentage was 5.36. He gave it in 102 cases of scarlet fever, and nephritis did not occur in any of them, although he admits that albuminuria was present in the most severe cases for the first few days of the disease. It has been suggested that nephritis may be caused by toxines which are not affected by urotropin: whether this is so or not, time will show.

Buttersack (Deut. Arch. f. klin. Med., 1904, Nos. 3,4) reports 10 cases of scarlet fever treated with urotropin, in none of which nephritis developed. His cases occurred in an epidemic which was characterised by the great number of cases of complicating nephritis.

Out of 57 cases admitted to the Swallownest Hospital, I have given urotropin in 56 (the other was admitted with well-marked nephritis; the case had not been recognised as scarlet fever - Case No. 23). I have prescribed it in doses of from 1 to 10 grains, according to age; to achild of 2 years of age, 1 grain, - and others in proportion, - three times a day in half a tumbler of water, for three weeks - i.e., during the time the patient was in bed. All the cases were mild, with one exception, and this had a well-marked rhinorrhoea. The urine was tested daily, and in none did I find a trace of albumen. The dosage was larger than that recommended by Widowitz, but no untoward symptom was observed in any case.

Coleman (Med. News, Aug. 29, 1903) has seen a small dose of urotropin cause an untoward effect, and he believes that individuals vary in their susceptibility to the drug. Toxic effects are of rare occurrence, and do not necessarily depend upon the size of the dose. Unless properly diluted, however, toxic effects are of frequent occurrence, and withdrawal of the drug causes the untoward symptoms to disappear in a few days. According to him the toxic effects are: Gastric irritation, abdominal pain, diarrhoea, measles-like rash attended with much itching, headache, ringing in the ears, renal irritation, and sometimes albuminuria. Irritation of the bladder and strangury, - the most common of the toxic effects, - irritant action on the raw surfaces in the urinary passages, haematuria, and haemoglobinuria. Eight positive cases, and one doubtful case, have been recorded as following the administration of urotropin, and in one case haemoglobinuria was associated with haematuria. Coleman also states that the most important of the toxic actions have been produced by the intravenous injections of formaldehyde, and he believes that these untoward effects are due either to special susceptibility to the action of formaldhyde, or to the interference with the usual disposition of formaldedyde in the body, or to the liberation of an anusual quantity of formaldehyde.

All my cases were of the ordinary type, and I gave a much larger amount than Widowitz, yet in none did I see any toxic effect. Perhaps this was due to the fact that it was well diluted. I also gave it for twenty-one (instead of six) days, without intermission, and no case of nephritis occurred, although it might have been the same if urotropin had not been administered. In the future I intend to prescribe it in all cases admitted as a routine treatment.

In all cases of scarlet fever, even of the mildest type, it is important that great attention should be paid to the mouth and throat, not only for the sake of the patient, but also for his surroundings; and by doing so, the occurrence of secondary infections is frequently

prevented. Hutniel records 100 cases of scarlet fever in which this was done, and he had no death or secondary complication.

Forchheimer recommends the routine administration of salicylate of soda as an efficient disinfectant for the mouth, and considers it to be inimical to the streptococcus. He gives a teaspoonful of a 0.5 per cent. to 1.5 per cent. solution every hour or so, according to the age of the patient, for the first two or four days of the disease, and he thinks it is of greatest value for children who cannot gargle, and who are afraid of the repeated use of the spray.

In those who are able to gargle, we may use some mild antiseptic solution every three or four hours during the acute stage of the disease; but I much prefer the use of the spray or the douche. Some prefer inhalations; others, direct applications by means of a swab. For my own part, I do not think gargles are to be relied upon, and young children do not care for the douche, as its application is unpleasant. The spray can be used in all cases, except in very young children, who are apt to struggle, and in those cases showing extreme weakness. As a rule, it is most effectual. We may use a saturated solution of boracic acid, listerine, some alkaline solution - e.g., borax, or bicarbonate of soda, and some recommend permanganate of potassium - fifteen grains to the ounce. Von Jürgensen sprays with ice-cold water, whilst others use sulphurous acid. A one-per-cent. solution of carbolic acid in lime-water has been recommended, but it is better to be avoided in young children; and chlorate of potash has been frequently used, but in children it is apt to have too depressing an effect. Dilute peroxide of hydrogen (one part to three or four of water) is very efficacious, especially if there be any sign of streptococcic infection. Corlett recommends the following:

R,	Mentholi	gr. iii
	Thymoli	gr. 1/10
	Olei Gaultheriae	m. ii
	Glycerini	ʒ iv
	Chlorophyli (sol. aquae)	q.s.
	Aquae q.s.	ad ʒ viii

This may be used as a mild disinfectant, as a gargle to the mouth and throat, or diluted in the form of a spray into the nares, larynx, etc. The chlorophyl is used to give it a green colour.

As a douche we may use salicylate of soda, or eucalyptus, and the latter is also good for inhalation.

Severe pain in the fauces may be relieved by painting with a solution of cocaine (1 to 5 per cent.), but it should not be used too frequently or symptoms of poisoning will appear. The mouth may be rinsed with cold water, and small pieces of ice held in the mouth give great relief; and when there is much enlargement and tenderness of the lymphatic glands, some recommend the application of cold compresses, or an ice-bag to the throat. Others use hot fomentations, or linseed poultices, which when well made and evenly applied to the throat, not only relieve the pain in swallowing, but also favour resolution, and when suppuration threatens, hasten the process. When the sore-throat is severe, and in those cases where the secretion is excessive and accumulates in the mouth, the spray should be used regularly, and great relief from the choking sensation is afforded by the frequent irrigation of the pharynx with hot water to which glycerine has been added (a drachm of glycerine to a quart of hot water). Some patients find most relief from the discomfort by taking the fluid nourishment as hot as possible.

During convalescence, some preparation of iron should be prescribed, especially in those cases where there is much anaemia. It may be combined with arsenic or quinine. Many order Wincarnis, or other preparations containing meat-extracts mixed with wine, but they are not supposed to be of much nutritive value.

High Temperature.- The treatment of cases in which hyperpyrexia occurs is not very satisfactory, as unfortunately nearly all have a fatal termination; but whenever the temperature in the rectum reaches 104°F., some means should be used to try and reduce it. The means we employ are - the administration of antipyretic drugs, and hydrotherapy.

1. Hydrotherapy. - Scarlet fever was one of the first diseases to be treated by cold water; as long ago as 1798, Currie, of Liverpool, treated many cases, including his own children, with cold affusions, and the results were excellent. To-day many authorities agree that the safest and most reliable treatment for reducing the temperature in scarlet fever is by the use of cold water, - in the form of cold sponging, cold packs, or the cold bath, the method being used which seems the most appropriate to the condition of the patient. After this treatment, we find the temperature not only lowered, but the pulse-rate is slowed, and its quality increased, diuresis is aided, and the grave nervous symptoms, which are so often present, in these cases, are ameliorated, and refreshing sleep is induced. Moizzard (p. 160) also states that the diarrhoea and vomiting, which occur so frequently in the grave forms of the disease, are "lessened or even cease under the action of the cold bath", and he considers cold water to be of the greatest service, just as it is in typhoid fever.

Von Jürgensen, Leichtenstern, and Trousseau strongly advocate the use of the cold bath, and the former (Nothnagel, p. 617) says: "I consider the best form of treatment, from the beginning of the invasion in scarlatina to the remission of the severe general symptoms to be the use of the cold bath". Whenever the rectal temperature reaches 104°F., the cold bath should be employed, and in young children the temperature of the water should be 68°F., (20°C.), and the duration of the bath should not exceed five minutes, but with older children and adults the temperature should be 59°F. (15°C.) and the duration the same, although it may be extended to fifteen minutes, according to Corlett. Some prefer cold but short baths, to warm baths of long duration. After the bath the patient is lightly dried and put to bed. In mild cases, these baths may not be necessary; in more severe cases, where the temperature does not reach 104°F., or should it fall during the day so as to warrant the term "remission", sponging, or a luke-warm bath (i.e., one in

which the water is made warmer), may be all that is necessary; but if the temperature is 104°F., he repeats the bath, according to the severity of the case, every two, three, four, or six hours, and the patient is put to bed after each bath.

In severe cases, where the cerebral symptoms (stupor, coma, drowsiness) are well-marked, and where the temperature is subnormal, a tepid bath is given, and the back of the neck and head are douched for a short time with cold water, whilst the patient is in the bath. This procedure, which is also recommended by Steffen (loc. cit. p. 231), is rather drastic, and should not be lightly undertaken, especially as such cases are usually fatal. It would be better to use the cold coil or an ice-bag.

In cases where convulsions are also present, accompanied with jactitation, extreme restlessness, and marked delirium, a warm bath (105° - 110°F.) should be given; and some recommended in addition, at the end of the same, a cold douche as above. The patient should remain in the bath for ten or fifteen minutes, and no narcotics should be used.

In severe cases when the temperature goes above 105°F., and remains there, and the cerebral symptoms are marked, a cold pack may be first tried, the effects of which may be very beneficial; but if no effect be produced, the graduated bath may be used. The temperature of the water at starting should be 80° - 90°F., and this should be rapidly reduced until the body-heat has fallen to 101°F. Frequently the result is very satisfactory and, as a rule, the friends do not offer so much objection as to the more drastic measures.

Ssokolow thinks scarlet fever a mild and uncomplicated disease if treated by hydrotherapy; and Schill (Wiesbaden) treated 110 successive cases of scarlet fever by these means, and in only one did nephritis develop. Leichtenstern (loc. cit., p. 616) also maintains that the cold water treatment of scarlet fever markedly diminishes the tendency to nephritis as a sequal, rather

than increases it. He also states that otitis is not more frequent under this treatment, whilst he has also seen severe and troublesome itching greatly relieved thereby.

Buxbaum ("Lehrb.d.Hydrothérapie", Leipzig, 1900) first sponges the body with a cloth dipped in cold water, " to gain the patient's confidence". If this is well borne, he next uses the half bath with friction and affusion. (The latter are essential to the treatment.) The duration of the half-bath depends upon its effects, and as they persist for a considerable time, it is not necessary to give more than two or three a day. If the cerebral symptoms are well-marked - e.g., stupor, convulsions, he orders warm baths with cold affusions, and if hyperpyrexia be present he recommends half-baths alternately with cold packs.

Henoch (loc. cit., p.684) thinks that the cold bath has a great tendency to cause collapse, and strongly recommends the use of cold packs and cold sponges; and A. Jacobi ("The Therapeutics of Infancy and Childhood," Philadelphia, 1898, p.237) also considers them to be very liable to cause collapse.

The treatment by cold baths cannot be undertaken very satisfactorily except in hospitals.

Most English physicians avoid the cold-pack and the cold-bath, as scarlet fever patients bear cold very badly, and instead of them use an ice-bag to the head, Leiter's coils, cloths wrung out of iced water mixed with vinegar or eau de Cologne; and the body may also be sponged with the same solution. Sometimes rubbing the body with ice, or packing the patient with bottles of ice, may be successful; and, according to Burney Yeo, an ice-cold enema of a few ounces of peptonised milk has a cooling effect. Some use tepid sponging, others the wet pack. A sheet is wrung out of tepid water, or cold water, or iced water, and wrapped around the trunk and limbs. The patient is laid upon a blanket, and also covered with two other blankets, and at the end of twenty minutes or

half an hour, the sheet is removed, the skin quickly dried with a towel, and the patient placed between dry blankets.

According to Von Jürgensen, the cold bath is contra-indicated in the following conditions:

1. All well marked cases of cardiac weakness, from any cause whatsoever, which does not respond to the use of stimulants. Especially also if a pancarditis be suspected.

2. Cases in which dyspnoea is a symptom, when accompanied by narrowing of the when air-passages.

3. Haemorrhage from the nose, throat, or mouth, from eroded vessels in the neck, and in the haemorrhagic diathesis.

4. Inflammation of joints. - If we do not expect to gain a considerable improvement by the bath, we should spare the patient the pain of movement.

Forchheimer adds a fifth. These cold baths are never to be given to young infants.

Berg (Med. Rec., July 12, 1904) discusses the difficulty in reducing the temperature in scarlet fever. According to him, in the eruptive stage " the subcutaneous swelling and infiltration which is part of the eruption, causes pressure upon the cutaneous capillaries, and their nerves. These capillaries do not undergo the primary contraction under the influence of cold which occurs when cold is applied to the healthy skin, nor does the secondary dilatation which follows the primary instantaneous contraction while the skin is normal, occur in the skin which is the seat of a scarlatinal eruption. There is, therefore, not that interchange of cooled blood from the periphery and warm blood from the centre which is so necessary a condition to the reduction of temperature by cold baths or packs. For the same reason cold baths and cold packs in scarlet fever inhibit perspiration, both primarily and secondarily".

For a temperature of 104°F., or over, Berg recommends the patient to be placed in a bath at a

temperature of 80°F., and at the end of five or ten minutes, hot water is added until the temperature of the bath is 90°F. After the bath, the patient should be wrapped lightly in a sheet, and covered by a thin blanket. Lesser degrees of pyrexia may be treated by spraying with water at 70°F. to which one-third of alcohol has been added. Friction of the skin should be avoided.

2. Antipyretics.- These drugs are not so much used as formerly, reliance being placed upon tepid sponging, etc. Von Jürgensen recommends one only - viz., phenacetin. He prescribes .7 of a grain and upwards for children, and 7½ grains and upwards for adults, four times a day, and thinks it is of use in septic conditions, as it lessens the discomfort of the patient. He says its influence upon the temperature, even in large doses, is uncertain, and has never seen it exert a favourable influence upon the course of the disease. He prescribes it in the form of lozenges with cacoa-butter. He avoids the coal-tar series on account of their depressing action. Caiger recommends antifebrin, in two to five grain doses, repeated in four hours if necessary, and considers it to be the best drug for lowering the temperature. When combined with the wet pack, he has often found it to be of the greatest value. Many give quinine with phenacetin; and when drowsiness, restlessness, or delirium occur, Henoch (loc. cit., p.684) advises, in addition to the tepid bath, a single dose of either quinine (gr.vii - xv) or phenacetin (gr.iv - viii) between five and six o'clock in the afternoon. Ashby (loc. cit., p.271) recommends quinine in one to three grain doses, together with cold packs in those cases in which the temperature remains high. He uses phenacetin in the same way in doses of one-quarter to one grain repeated as necessity arises. Antipyrin, as a rule, is too depressing, and is not to be recommended.

Burney Yeo says the safest and best way to reduce the temperature is to give quinine frequently, either in solution in chlorine mixture (see later under "angina"), or in effervescing form. He states that when quinine is

given in this way it has a remarkable effect in reducing the high temperature, and at the same time produces no depressing effect, neither does it cause any renal irritation or congestion. His prescription is:

R,

Sodii Bicarbonatis	ʒ i
Potassii Bicarbonatis	ʒ iss
Potassii Chloratis	gr. xii to xxxvi
Aquae ad	℥ xii

Solve et misce, ut fiat mistura alkalina.

R,

Quininae Sulphatis	gr. xxiv to xxxvi
Acidi Citrici	ʒ i
Syrupi Limonis	℥ ss
Aquae ad	℥ xii

Solve et misce, ut fiat mistura acida.

One or two tablespoonfuls of each mixture to be taken every two or three hours. The larger dose is for adults. Very young children may take doses of a dessert-spoonful.

He also states that the antipyretic effect of quinine is much greater when taken in this combination, than when given alone in solid form. He avoids antipyrin, antifebrin, thallin, kairin, and sodium salicylate, but says that good results frequently are seen from the frequent exhibition of small doses of phenacetin in combination with quinine. For children between the ages of two and ten years, the dose of phenacetin is one-quarter to one grain every hour or two.

Stimulants. - In the majority of cases of scarlet fever alcohol is never required, but when symptoms of cardiac failure and exhaustion appear, it should be given as in all other acute diseases, careful attention being paid to the state of the pulse and the character of the heart's action. Alcohol is eliminated partly by the

kidneys, and as one of our objects of treatment is to throw as little work on these organs as possible, there is no need to add to the risks of renal irritation by means of our therapeutic measures. When the pulse-rate becomes quickened, and when the artery is not well filled (i.e., of low tension), and when the first sound of the heart becomes weak, or the two sounds lose their normal tone, stimulants are indicated; and of the alcoholic stimulants, brandy, whiskey, or champagne are the best. In cases where ~~the~~ collapse is well-marked, brandy or whiskey, given in one or two teaspoonful doses in hot water every two or three hours, is the best, but when their is much thirst, and a dry parched mouth, one teaspoonful of iced champagne, with one of water, every hour, will be found most suitable. In the malignant cases, and those of the septic type, accompanied with high fever, a small, weak, rapid or even irregular pulse, cyanosis, cold extremities, and threatened collapse, the administration of stimulants becomes of the greatest importance, and in such cases brandy or whisky may be given in teaspoonful doses as often as is necessary. To a child of five years of age, such a dose may be given every hour. When there is great muscular debility, or the oncoming of typhoid symptoms, or a tendency to collapse, alcohol is imperatively demanded. (For other stimulants see under the treatment of cardiac complications.)

Cerebral symptoms, such as delirium, restlessness, and insomnia, are usually associated with a high temperature, and for their relief we should first try cold or tepid sponging (hydrotherapy), and if these fail, bromide of sodium or potassium, or chloral hydrate, may be given in addition to the hot bath, or the hot pack. Other hypnotics may be tried - e.g., sulphonal, paraldehyde, trional, or chloralamid. Opium has been recommended by some, but it should be used with caution, especially after the first week or ten days. Of course, its use is contraindicated in those cases in which albuminuria appears. Leeches may be applied over the mastoid process for the

relief of the cerebral symptoms, and Corlett says he has seen a fatal issue prevented in one case by their use.

Carne Ross affirms that decoction of cinnamon has an abortive action in scarlet fever; and Caiger says he has tried it (loc. cit., p.173) in two hundred consecutive cases. This treatment was commenced within twenty-four hours of the appearance of the rash, and he noted the occurrence of rheumatism, adenitis, nephritis, and albuminuria was about 50 per cent. below the average, but the general death-rate showed no reduction.

TREATMENT OF THE COMPLICATIONS.

Baginsky ("Die Therapie der Gegenwart", 1900, p.252) has used Credé's silver ointment in several cases of scarlet fever of unusual severity, with a view to antagonising the septic element. The method of inunction was the one prescribed by Schede, but the results of treatment were very disappointing. Ten out of thirteen cases died, and in those who recovered there was no assurance that recovery was due to the treatment, as it did not appear to have any specific influence upon the disease, and did not appear to have any specific influence upon the disease, and did not prevent the occurrence of otitis media, nephritis, etc.

Forchheimer (loc. cit., p.100) recommends the injection of large quantities of a sterilized normal salt solution into the circulation, with the object of diluting the toxines circulating in the blood. He says this form of treatment is indicated, not only in those cases where uraemia is threatened, but in those where there is a grave septic infection, and also in malignant cases, - although in the latter "we cannot be sure soon enough of the nature of the case to enable us to prevent the lesions that are produced by the toxine causing a fatal result". Corlett has tried it in a few cases, and has seen temporary relief in one case. On theoretical grounds the treatment

should be successful; and Forchheimer says it may be tried in three ways - viz.:

1. By injection into the serous cavities.
2. By injection into a vein.
3. By contemporaneous bleeding and injection into a vein (lavage du sang).

THE THROAT AND NOSE.

In the septic forms of the disease, when there is marked involvement of the throat, pharynx, and adjacent parts, it is of the greatest importance that active treatment should be undertaken at once, for by doing so, we hope, not only to limit the processes which are developing, and so prevent their extension to neighbouring tissues, but also to remove the results of this inflammatory, ulcerative, or necrotic process, and so protect the patient from the various secondary infections to which he is liable. The best method is to irrigate the mouth, throat, and nose with some suitable antiseptic at inbervals, according to the severity of the case. One of the best methods of treating the nose and throat is this, - Caiger says it is the best, and is to be preferred to spraying, gargling, or swabbing - viz., to thoroughly douche the parts with chlorine-water. This remedy, which was recommended by Watson, is made as follows: One hundred and eight grains of powdered chlorate of potassium are put into a twelve-ounce bottle, and sixty minims of strong hydrochloric acid are added, and the bottle quickly corked. Chlorine gas is at once liberated, and to hasten this, the bottle must be repeatedly shaken. Water is then poured into the bottle, only a very small quantity at a time (for if it be filled too rapidly, the chlorine will be driven off and not dissolved), the cork replaced quickly, and the bottle well shaken. The nose and throat should be well syringed with this solution, every two or three hours; and Caiger says the best form of syringe to use is a four-ounce rubber enema bottle, fitted with a vulcanite nozzle. If this be not at hand, a Higginson syringe will answer the purpose. The mixture may also be given internally, if

sweetened with syrup of orange peel, or lemon. Liquor sodæ chlorinatae (ʒ ii to O i) may also be used as a douche.

The process is not pleasant, but the amount of relief obtained is frequently very great; and the patient should hold his head over a basin, and keep the mouth open, and some force may be used in using the douche, as it will do no harm, if plenty of time is allowed for the patient to get his breath between each squeeze of the syringe. Children are apt to be very refractory, and it may be necessary to pin a sheet around them to restrain the arms. The nurse should hold the child's head under her left arm, so that the mouth is over a basin, and use the syringe with the right hand, but frequently a second nurse is needed. If the child shows extreme weakness, it should be held on its side, with its head at the edge of the pillow or mattress. A saturated solution of boracic acid, peroxide of hydrogen (2 to 4 per cent.), permanganate of potash (gr. xv to ʒ i), and a solution of chlorate of potash have also been recommended. The latter, owing to its depressing action, should be used with care, and it may also act as an irritant to the kidneys; but Jacobi (p. 260) recommends it in all cases of membranous pharyngitis, although he is careful to say that not more than fifteen grains should be given in twenty-four hours to a child of one year of age, and he also recommends this amount to be divided into doses given every hour or two. Carbolic acid, and perchloride of mercury (1 to 2000) have also been recommended, but are dangerous. Henoch ("Charité-Annalen", p. 562) recommends a one-per-cent. solution of carbolic acid for nasal irrigation.

Some recommend iced cloths - i.e., cloths wrung out of iced water, -or an ice bag to be applied round the neck and throat, the bag being covered with flannel to absorb the moisture. Others prefer heat, - a linseed poultice, or hot bran bags, - or boracic fomentations, or simply wrapping the part in warm gamgee tissue.

If the douche cannot be used in children on account of the struggling, the following powder may be blown into

the throat, but it is not so efficacious:

℞,

Sodii Bicarbonatis	ʒ ii
Potassii Chloratis	ʒ i
Sodii Biboratis	ʒ i
Pulveris Sacchari Albae	ʒ i

Misce ut fiat pulvis.

The following may also be used:

℞,

Linimenti Iodi	m xl
Acidi Carbolici Liquidi (pur.)	ʒ ii
Spiritus Vini Rectificat.	ʒ iv
Glycerini	ʒ iv
Aquae ad	ʒ viii

Misce.

Sig.- To be used as a spray.

℞,

Acidi Borici	ʒ i
Glycerini Boracis	ʒ i
Tincturae Myrrhae	ʒ ii
Aquae ad	ʒ xii

Misce.

Fiat gargarisma.

For nasal irrigation:

℞,

Acidi Borici	ʒ i
Boracis	ʒ ii
Aquae purae	℥ i

Solve et misce.

Fiat lotio. Sig.- To be used warm.

Spray for the throat in scarlet fever:

℞,

Glycerini Boracis	ʒ iv
Glycerini Acidi Carbolici	ʒ iii
Aquae Rosae ad	ʒ x

Misce.

When the fauces are foul and offensive:

R,

Acidi Carbolici m x
Liquoris Ferri Sulphatis ʒ iii
Glycerini
Aquae āā ʒ i
Misce.
Fiat applic.
Sig.- To be applied with a large camel's hair pencil every three or six hours.

When the parts are gangrenous, some have recommended the active destruction of the involved tissues by the galvano-cautery, or by Paquelin's cautery, but the close proximity of important blood-vessels, will prevent this treatment being effectually carried out.

In all cases characterised by the formation of membrane, even when limited to the tonsils, a bacteriological examination should be made, and this is imperative if the membrane shows any tendency to spread. If the Klebs-Loeffler bacillus be found, the diphtheritic antitoxin, in large doses, should be administered, and the case treated for diphtheria; but if only streptococci can be isolated, Marmoreck's, or other antistreptococcic serum should be injected with a view to preventing the spread of the membrane, and in addition some recommend Loeffler's iron-toluol solution. This consists of:

R,

Menthol 10 grammes (gr.150), dissolved in
Toluol 36 cubic centimetres (fl.oz.1,dr. 1, m, xl),
Liq.Ferri Sesquichlor. 4 cubic centimetres (fl.dr.1,m.viii),
Absolute Alcohol 60 cubic centimetres (fl.oz.ii).

This should be applied directly to the affected part by means of a cotton swab, once or twice in the twenty-four hours, and if the swab be held to the affected part for a sufficient length of time, the results are said to be very good.

If no bacteriological examination can be made, and if there is any doubt about the nature of the membrane, antistreptococcic serum should be administered, as it has been proved that it does no harm.

Von Jürgensen does not believe that much benefit is gained by using disinfectants, - as, in the first place, they (e.g., perchloride of mercury) cannot be used in solutions concentrated enough to have any value, and he says it is also a question if they penetrate through the superficial layers of the tissues into the deeper layers. He recommends spraying with ice-cold water as the best treatment.

In those cases where there is marked ulceration, or a gangrenous condition of the tonsils, Heubner ("Ueber Scharlach-diphtherie und beren Behandlung", "Verhandlungen des V Congresses für innere Medicin", 1886, S. 374; also "Bennerkungen über die Frage des Scharlachdipthteritis und deren Behandlung", Jahr. f. Kinderh., N.F., Bd. 31) recommends the injection of a three-per-cent solution of carbolic acid into the substance of the tonsils, or into the soft palate. An exploring syringe, with a shoulder near the point to prevent its penetrating the tissues too deeply, is used, and 8.11 minims (0.5 c.c.) are injected twice daily into each side. The treatment should be commenced on the third or fifth day of the disease, if the membrane is extending, or if it now makes its first appearance, and especially if there is marked swelling of the lymphatic glands, with a considerable rise of temperature. It should be continued until the local pharyngeal condition has completely healed, and until every considerable rise of temperature has ceased; as a rule, for four to ten days. As a result, the glands diminish in size to a great extent, the membrane ceases to extend, and that which is already present becomes much less. According to Heubner, in the Leipzig Polyclinic, from 1877 to 1879, 151 cases were treated without injection, and the mortality was 25 per cent.; from 1880 to 1888, 211 cases were treated with injections, and the mortality was 8 per cent. He says the procedure is a simple one and hardly painful.

Von Ziemssen and Sahli ("Verhandlungen des XII Congresses für innere Medicin", 1893, S. 192) think that this treatment is of value; but, according to Corlett (p. 271), in the Children's Hospital of Vienna, it has been occasionally followed by necrosis, and its value has been regarded as doubtful.

Some have used a five-per-cent. solution of carbolic acid in glycerine; or a saturated solution of salicylic acid in alcohol, as a local application in these cases.

Siebert, in 1894, used ichthyol for the dermatitis in scarlatina only, and with much success: since that time he has used it for an irrigation to the throat. He uses a solution of five per cent., and applies it through the nose, but when this is blocked, he applies it through the mouth.

Stengel considers that when ichthyol is so used, it is non-toxic, cuts short the angina, and prevents complications due to the streptococcus. He also regards ichthyol irrigations as a prophylactic against the disease.

If suppuration occurs, or if a retropharyngeal abscess develops, free incisions must be made.

Treatment of the Early Purulent Rhinitis. - According to the report from the isolation hospital at Porte d'Aubervilliers (Rev. d. Mal. de l'enfance, Feb., 1901), prophylaxis is very important in the treatment of this complication of scarlet fever; for, if the condition is fairly established, it is frequently impossible to do any good, and even when the discharge is checked, the patient may succumb to the severity of the general infection. When the patient is attacked, active treatment must be commenced. A Nélaton's catheter is passed through the nose and out of the mouth, so as to bring three small apertures, previously made with scissors in contact with the nasal fossa, and later if desired, with the pharynx. This catheter is connected with an irrigation apparatus, and the nasal passages irrigated at regular intervals with a solution of bicarbonate of soda (4 to 1000). The reservoir should be from twenty to thirty inches above the patient, and the irrigations should be practised three or

four times a day, and twice during the night. The fluid escapes externally through the eye of the catheter, as well as through the apertures, and after each irrigation a little mentholated or resorcinised ointment is introduced into the nostrils with a tampon.

THE EARS.

In every case of scarlet fever it is of the utmost importance that thorough attention should be given to the throat, so as to prevent, as far as possible, the inflammatory processes extending to the ears; but in the case of refractory children, great care must be taken in the use of the spray or douche, - for if a great amount of force be used, more harm than good may be the result. Again, the ears should be carefully examined day by day in a good light, especially when the throat symptoms are severe, for the diagnosis of ear trouble is difficult in young children, and frequently the escape of pus from the external auditory meatus is the first sign of the occurrence of otitis media. Many of the subsequent evils of this complication may be prevented if careful and proper treatment is carried out from the beginning of the earliest symptom.

As soon as the patient complains of pain in the ear, it should be gently irrigated with water, or a normal salt solution, as hot as can be borne, and the child's head may be laid upon a hot water bag, hot salt bag, or hot bran bag. Some have recommended a small bag, like a glove finger, to be filled with hot salt, and placed gently in the ear. If this gives no relief, then in addition, a few drops of a mixture of equal parts of laudanum and glycerine, or equal parts of a five per cent. solution of cocaine and glycerine, may be dropped into the ear. (It is better for these solutions to be first warmed before being introduced.) Some use a few drops of glycerine of carbolic acid, or liquor atropinae sulphatis, or a solution of the latter and a solution of five per cent. of cocaine, whilst at the same time a belladonna and opium fomentation may be applied externally. When cocaine is used, the ear may be more thoroughly and easily examined by the speculum. Some have

recommended the application, at an early stage of the illness, of mustard behind the ear to arrest the inflammation, but many think it should be avoided, as it masks any mastoiditis which may be present; others use leeches, in front or behind the ear, and frequently when applied early on in the disease, they have quickly relieved the pain and inflammation. Burney Yeo ("Medical Treatment", Vol. 2, pp. 610-611) says the following is the most effectual way of relieving the pain, and frequently succeeds when other measures have failed: A large wineglass is heated by pouring hot water into it, and then ten to twenty minims of chloroform are dropped upon a small piece of cotton wool in the bottom of the glass, which is then closely applied to, and held over the affected ear. The vapour of chloroform enters the ear, and acts both as an anaesthetic and as an antiseptic. Subsequently, tincture of iodine may be mixed with the chloroform, and mixed chloroform and iodine vapours are then conveyed into the ear, whilst at the same time iodine paint should be applied behind and in front of the ear. If the pain and inflammation still persist, and when pus is evident from bulging and opacity of the tympanic membrane, the latter should be incised at once, so as to give exit to the pent-up exudation, and so minimise extension to other parts, and perhaps save the patient from chronic suppurative otitis. Caiger thinks it is not necessary to incise the membrane in young children, as in these the external canal is of such a small calibre, and is so exquisitely tender that the introduction of the speculum gives rise to extreme pain, and the view obtained is not satisfactory. In these cases he employs remedies for the relief of the pain, and waits for the membrane to rupture spontaneously (which it usually does in a very short time), and if the after-treatment is thoroughly carried out, no harm results from the waiting.

Whenever the discharge appears, it is of the utmost importance to try and keep the ear aseptic; and it must be irrigated with some suitable antiseptic solution every two, three, or four hours - e.g., a saturated solution of boracic acid, bichloride of mercury (1 to 5000),

or a mixture of equal parts of glycerine of carbolic acid and glycerine of borax, - one drachm of this being added to each ounce of hot water. It is also advised by some to blow a little boracic acid, or iodoform, or a mixture of both, into the ear after each irrigation. The ear should be carefully dried after each irrigation, and a pad of cyanide gauze or salalembroth wool placed over the ear, and kept in position with a bandage, and the child should be encouraged to lie on the affected side. Some insert a small plug of gauze, or wool covered with iodoform, into the external meatus, and Yeo dips the wool into a solution of sulphate of zinc and rose water, - gr.v to the ounce. He also recommends the chloroform and iodine vapours to be used in addition to the douches of antiseptics, even in cases where there is no pain.

In some cases it may be necessary to clear out the pent-up secretions from the tympanic cavity by means of Politzer's bag; but great care should be exercised in using this treatment. At a later stage, Yeo advises the use of the iodine vapour alone. If the incision in the membrane closes prematurely, it should be incised again; and there is no danger in repeated incisions: the discharge of pus is the most important object.

If after a week or two the discharge persists, we should use a solution of equal parts of hydrogen peroxide and warm water, carbolic acid lotion (1 to 40), to which is added two grains of sulphate of copper or zinc to the ounce, sulphocarbolate of zinc or copper, alum, nitrate of silver, acetate of lead, perchloride of mercury, lysol (1 to 2 per cent.), creolin (weak solution), resorcin (2 to 3 per cent). Insufflation of boracic acid, iodoform and boracic acid (equal quantities), or iodoform alone (when the discharge is very offensive), aristol, and europhen may be used after syringing. These insufflations should not be used except when the hole in the tympanic membrane is large, - if small it will become blocked. At a later stage if the discharge is persistent, a solution of rectified spirit and water may be dropped into the ear, twice or three times daily, commencing with a solution of

one in four, and gradually increasing up to equal parts.

Frequently pain and swelling may appear over the mastoid process, accompanied by a rise of temperature. The skin becomes reddened, and there will be tenderness, - indicative of the appearance of a superficial mastoid abscess. In such a case, a free incision should be made down to the bone (i.e., through the periosteum), and a little behind the auricle, in order to evacuate the pus (Wilde's incision). In the great majority of cases, the mastoid cells will be full of pus, especially if the bone be carious (the mastoid always feels rough to the probe), and frequently a small sinus can be found which communicates with the sub-periosteal abscess. The incision gives great relief; but in such cases it is necessary to open the mastoid process at once, for if not, a permanent sinus is left, and the bone will become carious, - giving rise to the necessity for a more severe operation at a later stage, and perhaps not under such favourable conditions.

The antrum and the adjoining cells should be opened, either by means of a burr driven by a dental engine, or an electric motor, or by a gouge. The burr is considered by McEwan to be the safer, and by its use jarring of the intra-cranial contents is avoided, and a perfectly smooth surface is secured in which the orifices of any fistulous tracts are readily detectable. The contents, usually granulation tissue, should be scraped away, all infected cells opened, all carious and overhanging bone should be gouged or burred away, and the opening between it and the tympanic cavity enlarged. In opening the antrum, it is advisable to make the opening conical, with its base uppermost, and its main axis parallel to the posterior wall of the auditory meatus, and great care should be taken not to injure the facial nerve. The cavity is now washed with some antiseptic solution - e.g., perchloride of mercury or carbolic acid, - and the solution should be driven through the antral cavity until it emerges from the external auditory meatus, - the head being held inclined to the affected side to prevent the

solution going down the Eustachian tube. The cavity should be thoroughly packed with a strip of gauze soaked in iodoform emulsion, the end being left to form a drain; the external auditory canal is filled with the emulsion, and lightly packed with gauze, and a gauze and wool dressing firmly applied over all. The wound will need to be dressed night and morning, first syringed with the antiseptic, and then packed as before. If granulation tissue forms, it should be touched with nitrate of silver or chromic acid.

Sometimes the aural discharge persists after the mastoid wound has healed, and may be due to the presence of dead bone in the middle ear. In such cases this must be removed, and it may also be necessary to remove the remains of the tympanic membrane, and also the ossicles, before the discharge will cease.

In those cases where the mastoid was not affected in the first place, and where thepurulent discharge lasts for more than six months, it may be necessary to explore the mastoid antrum for pus, and to allow of thorough irrigation of the middle ear, with the object of causing ultimate obliteration of the antral cavity. This should always be done in such cases when dead bone can be felt in the middle ear. It may be necessary in some cases to explore the lateral sinus for thrombosis, or the brain for abscess.

THE LYMPHATICS.

As a rule, the lymphatic glands in the submaxillary and cervical regions which are enlarged secondarily to the infection from the nose and throat, are those which require treatment. In exceptional circumstances only, shall we have to treat those which are enlarged as a result of the scarlatinal toxine circulating in the blood. Many physicians apply heat in the form of linseed poultices to the enlarged, tender, and inflamed glands, and these may cause the process to end in resolution; others use an ice-bag, with a layer of flannel next the skin, or iced-cloths, for twenty-four to forty-eight hours, and if

the inflammatory process is not checked, they then resort to linseed poultices. Glycerine and belladonna may also be applied.

Von Jürgensen (p.627) says cold "is only allowable, however, when the skin that covers the swollen packets of glands is not blanched and traversed by veins that raise themselves from the white surroundings as thick cords, and there is no oedema present depending upon a disturbance of the lymph circulation. Inflammatory oedema, on the other hand, and a red, hot, swollen skin, of course, present no contra-indications". He utters a caution about continuing it too long and says that "if the symptoms are those of an imperfect blood and lymph circulation, the application of moist heat - the thickest poultices, and as warm as possible - is to be recommended as the best adapted for the case; indeed, absolutely required".

Forchheimer (loc. cit., p. 104) recommends the application of collodion in addition to the ice-bags. He says that flexible collodion should be painted over the gland and some distance beyond it, twice or three times daily, until it forms a thick membrane, the continuity of which must be constantly kept up by repeated applications of the collodion. He is of the opinion that the collodion prevents the absorption of septic materials by the superficial lymphatics, and states that in his long experience he has never seen a case of angina Ludovici when this method was employed. If the gland still enlarges, he discards the ice-bag in favour of linseed poultices, and still applies the collodion, but thinks it is of more importance to apply it around, than on the gland itself.

As soon as the fluctuation can be detected in the gland, it is of the greatest importance that a free incision should be made, and the pus evacuated: indeed, some - e.g., Forchheimer, would recommend it before it was detected, if the gland remains inflamed and enlarged, so as to limit the inflammatory and necrotic processes. A drainage tube may be inserted, although some say this is unnecessary, and the wound must be thoroughly irrigated

with some antiseptic lotion, and dressed with carbolic or boracic poultices. The patient's general condition must be attended to; it may be necessary to give a saline purge, followed by the administration of iron, which may be combined with arsenic.

In those cases where there is much cellular infiltration of the tissues of the neck - angina Ludovici - free incision should be at once made into the indurated parts to relieve pain and tension, and allow of the escape of the pent-up inflammatory products. (As the presence of suppuration is often hard to determine, we should not wait until we are positive that it has occurred.) The wounds should be irrigated with hot boracic lotion, and hot boracic or carbolic fomentations applied, whilst some also recommend the parts to be dusted with iodoform.

Goodall and Washbourn ("Infectious Diseases", p.108) consider it is better to wait until the skin has broken before making incisions, as when it is done early it rarely prevents sloughing of the skin and subcutaneous cellular tissue. The skin will be found to be undermined, and this should be freely opened up, and the underlying sloughs should be removed, but force should not be used in separating them, as troublesome bleeding may occur.

The enlarged lymphatic glands following scarlet fever should be treated by the internal administration of creosote (one-half to two minims, three times a day - Forchheimer). Some have recommended painting with tincture of iodine, inunction of ichthyol ointment, iodide of lead ointment, mecurial (blue) ointment, iodine ointment; but according to von Jürgensen, these do not seem to do much good. Internally, syrup of the iodide, or other preparation of iron, arsenic, and cod-liver oil are valuable.

In angina Ludovici stimulant treatment is clearly indicated.

THE HEART.

Cardiac changes are much more frequent in scarlet

fever than is generally appreciated, and it is of the utmost importance to watch the condition of the heart throughout the whole course of the illness. When symptoms of cardiac dilatation appear, digitalis or strophanthus may be prescribed, and when there is any alteration in the rhythm of the heart, or when marked tachycardia or bradycardia appear, Schmaltz recommends the continuous application of an ice-bag to the praecordium, and he has found this treatment to be of considerable service, whilst digitalis and strophanthus, according to him, are useless. In addition, it may be necessary to use other stimulants (see later), and Forchheimer also recommends nitroglycerine, either internally or hypodermically.

Endocarditis and pericarditis may occur, and are especially associated with synovial and articular complications. In pericarditis we must be on the look out for effusion, which may hinder the heart's action, and necessitate the performance of paracentesis. In these cases the salicylates should be tried, but great caution should be exercised in prescribing mercurials. If the heart's action is at all interfered with, digitalis or strophanthus must be administered. Endocarditis and pericarditis must be treated by the application of the ice-bag over the praecordium, and in addition small pieces of ice may be swallowed.

When symptoms of exhaustion and threatened cardiac failure make their appearance, it will be necessary to give strychnine every three or four hours. It acts best when given by hypodermic injection, and to a child of three years of age, one-hundredth of a grain may be given thrice daily.

A mixture such as the following may be ordered:

℞,

Spiritus Aetheris
Spiritus Ammonii Aromatici aa ℥ m v - xx
Aquae Camphoratae (fort.) ad ℥ i

Misce.

Sig.- To be given every hour.

Caffein may also be given, and ether by hypodermic injection. Henoch (p. 685) recommends camphor by hypodermic injection, - one-half to three grains every two or three hours. The camphor may be dissolved in rectified spirit (1 to 5), or in ether, - one part of camphor to ten parts of ether. Musk has also been recommended, - one-half to three grains every two hours. When the peripheral circulation is very bad, nitroglycerine may be added to the foregoing remedies.

In those cases where collapse threatens, Moizzard (p.161) gives caffein in doses of three-quarters to one and one-half grains, or the sulphate of sparteine dissolved in distilled water, in doses of one-third of a grain or more, hypodermically, and in cases with a low temperature and showing grave toxic symptoms, Jacobi (p. 237) recommends morphine in doses of one-fiftieth to one-twentieth of a grain, to be repeated if necessary. When the pulse is weak, soft and of low tension, Holt (loc. cit.) advises the administration of digitalis.

THE JOINTS.

Although, in the opinion of many authorities, the changes in the joints in scarlet fever are due to a streptococcic infection, it is usual to prescribe salicylic acid or the salicylates internally - frequently with marked results; and there is no reason to believe that their administration ever affects the kidneys injuriously. In a mild case perhaps, it may be only necessary to apply opium, or belladonna and chloroform liniment locally to the affected joints, which must then be wrapped in warm cotton wool, kept in position with a flannel bandage, the limb being made comfortable by pillows. If the joints show marked changes, and especially if the heart becomes affected, salicylate of soda must be given in large doses, and if much pain be present, it may be combined with phenacetin, whilst the joints are also bathed with an alkaline solution, or methyl salicylate. Forchheimer states that if no effect follows the administration of full doses of the

salicylates in twenty-four hours, we are dealing with the septic form of the disease; but if no pus is present, he recommends their continuous use in small doses. We should prescribe the salicylate of soda in doses of fifteen to twenty grains every three or four hours, and if one or more joints remain swollen or tender for some time, and especially if the temperature remains elevated under this treatment, the joints should be aspirated under strict antiseptic precautions; and if the effusion be purulent, free lateral incisions should be made on each side of the joint, which should then be freely irrigated with some antiseptic solution - e.g., carbolic acid 1 in 20. The joint should be drained, and dressed with antiseptic gauze and wool, kept in place with a flannel bandage, and the limb placed upon a splint. The dressings must be changed as often as is necessary, and the joint irrigated at each dressing. Caiger (loc. cit., p. 175) recommends small lateral incisions, and after the joint has been irrigated, all the lotion should be allowed to escape, and the incisions closed with small pieces of antiseptic gauze soaked in collodion. The joint is wrapped in layers of sal-alembroth wool, and firm, but elastic, pressure is applied with a bandage, and the limb placed on a splint. In many cases the pus does not reform, and in a fortnight or three weeks, gentle passive movements were allowed, and a sound joint resulted.

If on aspiration of the joint the fluid be found to be serous, and if it reappears after the aspiration, a succession of fly-blisters may be of great value.

Caiger states that the purulent condition of the joints usually supervenes upon a condition which, though originally rheumatic, did not prove amenable to the action of the salicylates. In the septic form of the disease when the symptoms are severe and persistent, it would be advisable to try the effects of antistreptococcic serum.

In cases where tenosynovitis occurs, the local application of cold (e.g., ice), or warmth may be used, and the administration of mercurials may be of service.

The after-treatment of diseased joints and tendons is very important, as great deformity may result if proper precautions are not taken.

ULCERATIVE STOMATITIS.

In an ordinary case of scarlet fever, rinsing the mouth with a solution of boracic acid is all that is required, whilst in the more severe forms, the solution of chlorine should be used every three or four hours. The affected parts may also be painted with glycerine of borax, or nitrate of silver, all carious teeth should be extracted, and the remainder should be kept carefully cleansed. Instead of the chlorine solution we may use Condy's fluid, or a solution of perchloride of mercury, but great care should be taken when the latter is used, especially in young children. In cases characterised by much ulceration and sloughing, a ten per cent solution of nitrate of silver, or a solution of perchloride of mercury (1 in 500) may be applied locally; and in those cases which have become gangrenous - noma - the diseased parts should be removed by the curette, followed by the application of fuming nitric acid, or the actual cautery. To enable this to be thoroughly applied, it will be necessary to administer an anaesthetic to young children, but the local application of cocaine may be sufficient for adults. After the operation, olive oil should be applied to the inside of the mouth, and the parts should be frequently irrigated with some antiseptic solution - e.g., boracic acid; and if at any time within forty-eight hours we notice an extension of the disease at any point, the operation should be repeated upon the affected area. If the case be seen at once, and if energetic treatment be commenced at an early stage, excision of the parts will be rarely required.

THE GASTRO-INTESTINAL TRACT.

In the majority of cases, the vomiting which is an early and constant symptom in the disease, stops of its own accord and requires no treatment; but in some

cases it may be so severe, as to seriously imperil the life of the patient, and when it lasts after thirty-six or forty-eight hours, it is of ill-omen.

In such cases we should give milk, which has been boiled, and mixed with an equal part of boiled water, soda-water, barley water, or lime water. It should be given iced, in teaspoonful doses, every ten or fifteen minutes. Albumen water may be given if preferred. A sinapism should be applied to the epigastrium; the patient should swallow small lumps of ice, and iced mineral waters or champagne may also be allowed. An effervescent mixture may be prescribed, for example -

R,

Sodii Bicarbonatis 3 ii
Spiritus Ammonii Aromatici 3 ii
Aquae Menthae Piperitae ad ℥ viii
Solve et misce, ut fiat mistura alkalina.

R,

Acidi Citrici 3 ii
Aquae ad ℥ iv
Solve, ut fiat mistura acida.
Sig. - Two tablespoonfuls of the alkaline mixture to be taken with one tablespoonful of the acid mixture, every four hours during effervescence.
(This prescription is for an adult.)

Bismuth may be given with lime water, or cinnamon water, or in powder - e.g.

R,

Hydrargyri Subchloridi gr. 1/12
Sodii Bicarbonatis
Bismuthi Carbonatis āā gr. v -x
Misce ut fiat pulvis.
Sig. - To be given dry on the tongue every three or four hours.

The muriate of cocaine, one-fiftieth to one-twentieth of a grain, and menthol, may be given

internally, and if the vomiting be persistent, small doses of opium may be ordered every two hours. Sometimes tincture of iodine, in one minim doses, well diluted, may be given every hour or second hour, and in very severe cases it will be necessary to stop all nourishment by the mouth, at any rate for some hours, and resort to rectal feeding. Normal feeding must be very slowly resumed, nourishment being given in very small amount, at frequent intervals.

The diarrhoea which occurs at the beginning of the attack may be left to itself, and only requires treatment if it becomes profuse, and cause great weakness; but when it occurs late in the disease, especially in severe cases, it demands immediate attention. The patient should be placed upon an absolutely milk diet, and carbonate, subgallate, or subnitrate of bismuth may be prescribed, in conbination with catechu and chalk. Salol may be given in powder combined with bismuth, and in some cases it may be necessary to order opium. The following may be of great service:

R,
Pulveris Ipecacuanhæ Compositi
Bismuthi Subnitratis
Sodii Salicylatis ää gr. xii
Misce, et divide in pulveres sex.
Sig. - One powder to be given every four or six hours to a child of five years of age.

Sometimes tannate of quinine is of service.

When the diarrhoea comes from the lower end of the bowel, its significance is much more serious, and in these cases the lower end of the bowel should be irrigated, by means of a rectal tube or soft elastic catheter, with large quantities of distilled or sterilised water, to which is added some antiseptic, especially tannic acid. Carbolic acid, in one minim doses, may be given internally, or bismuth and Dover's powder, and in obstinate cases a starch and opium enema may prove very serviceable.

Sometimes milk does not agree with the patient, and may produce or aggravate the diarrhoea: in such cases it should be replaced by egg albumen - i.e., albumen water.

TONSILLITIS, BRONCHITIS, PNEUMONIA, AND PLEURISY.

The treatment of these complications should be the same as when occurring under other circumstances, and presents nothing special. The tendency of the pleural effusion in scarlet fever to become purulent should not be forgotten, and when empyema is diagnosed, the usual operation of resection of a rib must be undertaken for the evacuation of the pus. O. Vierordt (loc. cit., p.201) reports several cases where one aspiratiom of an empyema resulted in a permanent cure.

ECZEMA.

When this occurs at the orifice of the mouth, nose, or ears, particular attention must be paid to the discharge which is the cause of it, and the child should be prevented from picking the affected parts. All scabs should be removed by bathing in warm water, warm water and oatmeal, hot boracic acid lotion, or by a linseed or bread poultice, and then oleate of zinc, boracic acid ointment, zinc ointment, or ammoniated mercurial ointment should be applied to the raw surfaces. Great care should be taken in drying the skin after the bath, and during the winter months, especially in children with tender skins, anointing the body with lanolin, or lanolin and almond oil (one part of the latter to six of the former) may be used during the peeling. If the eczema should become chronic, arsenic should be given internally, and strict attention paid to the dietary, with a minimum or absence of butcher's meat.

NEPHRITIS.

Owing to the frequency with which nephritis occurs during the third and fourth weeks of scarlet fever, many

physicians keep their patients in bed, at any rate, until the end of the third week, and even longer if the epidemic is characterised by the occurrence of nephritis, - so as to secure a uniform temperature of the body. As this complication may come on very insidiously, and even in rare instances without the urine giving any warning, it is advisable for a urinary examination to be made daily, and an accurate record should be kept of the amount passed during the twenty-four hours. We should also be on the look out for oedema - e.g., of the lower eyelids, which may be noticeable before the occurrence of albuminuria or haematuria. As soon as we find that we have to deal with such a complication, our treatment should be directed towards giving the kidneys as little work to do as possible, and we accomplish this by increasing the activity of the skin, and bowels, lowering the arterial pressure, and treating serious complications when necessary - e.g., effusion into the serous cavities.

The patient must be kept in bed, as this is absolutely essential for his safety, for in no other way can we secure a uniform temperature over the entire surface of the skin. He should lie between blankets, and wear a thin flannel nightgown, with long sleeves reaching to the wrists. The diet should consist exclusively of milk, which is often rendered more digestible when mixed with one-third or one-half of boiling water, and he should take the milk in mouthfuls at a time, and not large draughts, which frequently cause a feeling of weight in the stomach. He should be encouraged to drink plenty of water, barley water, lemonade (made without sugar), or the imperial drink which is made by putting two teaspoonfuls of cream of tartar, the juice of one lemon, and a little sugar or syrup into a jug, and pouring one quart of boiling water over it, and allowing it to cool. If palatable to the patient, this should be made without sugar. When the patient cannot take milk, whey should be given, and this is made by boiling milk with a little lemon juice, or with cream of tartar, - two tablespoonfuls to the pint, - and then straining. It is very nutritious, and is of great value. Buttermilk may be taken instead of milk.

Sir Wm. Roberts recommended the administration of an alkali, so as to lessen the acidity of the urine; and we may dissolve ten grains of bicarbonate of soda, and ten grains of citrate of potash, in one ounce of water, and one or two tablespoonfuls of this solution may be mixed with a tumblerful of milk and water.

In mild cases the above treatment may be all that is necessary, but in the majority something further must be done. The skin should be encouraged to act by hot baths, or hot air, or vapour baths, or by means of the wet-pack. The hot air bath frequently is very efficacious, and may be used as follows: A spirit lamp is placed at the foot of the bed, and a tin funnel, bent at a right angle, is connected with it, and passes under the bedclothes, which are tucked around the patient's neck, and the heat given off by the lamp, together with the steam formed by the combustion of the spirit, usually cause the patient to perspire freely. If the skin remains hot and dry, perspiration can be started by giving a warm stimulating drink.

Another way of giving a hot air bath is as follows: Wrap the patient in a blanket, and around him place bottles of hot water, hot bricks, or hot flat-irons, first covered with flannels, to protect him from the danger of a burn. A mackintosh is placed over these and the patient, then another blanket, and if necessary we may give a warm drink.

The hot bath is used as follows: The patient is placed in a bath, the temperature of which is from 100° to 110°F. Some begin at 100°F., and add hot water gradually until the temperature reaches 104° - 106°F. The patient should remain in the bath for ten or fifteen minutes, - according to some, half to one hour, - and the surface of the body may be gently rubbed. He is taken out and wrapped in a linen sheet, which has been soaked in hot water, and with one or more blankets is put into a warm bed, and covered up for one, two, or three hours. A wet cold cloth should be placed on the head and changed

frequently during the pack, so as to lessen the tendency to congestion of the brain. He is given hot water to drink during this time, at the end of which he is thoroughly dried with warm towels, fresh warm clothing is given him, and he is put into a warm bed. The difficulty lies in bringing the bath alongside the bed, and if we have to take the patient into another room, we may give him a chill.

The wet-pack is used as follows: The patient is wrapped in a blanket or sheet dipped in water at a temperature of 100 F., and then covered with hot blankets, over which is placed a mackintosh cloth. Whitla dips a large, thick, double blanket into nearly boiling water, with which a few ounces of mustard have been mixed. It is left in for a few minutes, and is then wrung out by the attendants, and the patient, except for the face and neck, is wrapped in it. As the difficulty is to keep the patient hot enough, there is no risk of it being too hot. The patient is placed upon a straw mattress, covered with blankets for two hours, when profuse perspiration occurs. He is then rubbed dry, and placed in a warm bed between the blankets. When in the pack he is given warm barley water or whey freely.

These different methods may be repeated as often as is necessary.

When the patient complains of much pain in the loins and especially when the urine is bloody he may lie upon a hot water bag, or linseed meal poultices may be applied every three or four hours over the kidneys. Some consider this to be of no use whatever, and recommend dry cupping instead; and in the robust we may try wet cupping, or fifteen to twenty leeches may be applied, followed by a linseed poultice. The poultices should never be allowed to get cold, and if the nurse is incompetent, it is better to abandon them, and use hot cotton wool or gangee tissue instead. Wet cupping, to several ounces, may be of great benefit when there is complete suppression of urine. Some recommend the repeated application of hot mustard poultices; and Dujardin-Beaumetz applies Paquelin's cautery.

Pilocarpin may be administered hypodermically, on account of its action in promoting profuse diaphoresis, but it should be used with great caution, as it is apt to produce symptoms of serious collapse, especially in children. When cardiac weakness exists, it is contra-indicated, and its administration should be always preceded by giving a stimulant - e.g., brandy, hot coffee, and if the patient cannot swallow, the stimulant may be given by hypodermic injection, or by the rectum. It should never be given to children, and the dose for an adult is one-sixth to one-third of a grain, - or rather one-twelfth of a grain repeated at an interval of fifteen or twenty minutes. When the bronchial tubes are filled with secretion, it should never be used.

The bowels should be encouraged to act freely by the administration of sulphate of magnesium, or sulphate of soda, - two to three drachms of either dissolved in one or two ounces of warm water and given fasting in the morning. It is necessary for the bowels to act daily, and it is much better to have a watery motion. Calomel and other mercurials should be avoided, but compound jalap powder is of great service, and may be given in a dose of half to one drachm, once or twice daily, in a little water. When once the bowels have been freely moved, a daily evacuation may be kept up by means of a milder aperient - e.g., a seidlitz powder, and in children one or two ounces of fluid magnesia with a little lemon juice in the morning, or a few grains of compound scammony powder at night, may be all that is necessary. In some cases an enema may be sufficient. As a rule, it will not be necessary to use elaterium (which should be given with caution to children), croton-oil, or gamboge.

We should administer those diuretics which flush out the kidneys, but do not raise the blood pressure - e.g., citrate of potash; and with it we may combine diaphoretic remedies - e.g., spirit of nitrous ether, solution of ammonium acetate -

R,

Potassii Citratis	gr. xv
Spiritus Ammonii Aromatici	m xv
Spiritus Aetheris Nitrosi	ʒ ss
Liquoris Ammonii Acetatis	ʒ iv
Aquae Camphorae ad	℥ iss.

Solve et misce.

Sig. - To be given every three or four hours to an adult.

The best diuretic is water; and in some cases sodium benzoate and sodium bicarbonate may be prescribed for their diuretic properties.

In those cases where the temperature is high, and the arterial tension very much increased, we may give one or two minims of tincture of aconite every three or four hours, for four or five doses. It must not be continued longer, on account of its depressing action; and if it is going to do good, it does so at once. Sodium nitrite, nitro-glycerine, and erythrol tetranitrite also lower the blood pressure.

Those diuetics - e.g., digitalis, strophanthus, which cause an increase of the arterial tension should not be used in the early stage; they are indicated when the heart's action is feeble, and when the pressure of the blood is low. Caffein is useful in these cases also, and may be given by the mouth, or by hypodermic injection; three to ten grains of caffein, with the same quantity of sodium benzoate are dissolved in a few minims of warm sterilised water, and used for each injection. Diuretin (theobromin-sodium-salicylate) has yielded good results in the hands of some, - with others it had proved a failure; and von Jürgensen in some cases has seen good results from the double salt of sulphuric acid with caffein and sodium. I have prescribed Diuretin in several cases, but the results have been disappointing.

When much anasarca is present, and especially when the heart is getting enfeebled, it may be necessary to give relief by puncturing the skin of the legs, using

Southey's tubes, under strict antiseptic precautions. We must be on the look out for hydrothorax, hydropericardium, or ascites, which must be removed by aspiration (paracentesis) when causing serious dyspnoea.

Vomiting may be a troublesome symptom during nephritis, and should be treated by the application of a mustard poultice to the epigastrium. Small lumps of ice may be swallowed, and bismuth in combination with dilute hydrocyanic acid should be prescribed. Creosote, in one minim doses, may be tried, and frequently drop doses of tincture of iodine in one drachm of water every hour, succeed when everything else has failed. Peptonised milk may be given, and if the sickness persists, no nourishment should be given by the mouth, and the patient must be kept going by means of nutrient enemata.

When there is much blood in the urine, and especially when it is persistent, it may be necessary to administer astringents - e.g., ergot, gallic acid, and especially the tincture of the perchloride of iron. Nitroglycerine, one-hundreth of a grain given hypodermically, has been said to be of much service in these cases.

URAEMIA.

Whenever uraemia threatens, which is shown by the occurrence of drowsiness, headache, vomiting, diminution of urine, (it may occur when there is a copious secretion of urine), and, most important of all, muscular twitchings, however slight, we must act energetically at once. One minim of croton oil should be mixed with a little butter, and smeared on the back of the tongue, or floated in a little milk if the patient can swallow; or we may place one-half to three grains of pulvis elaterini compositus on the tongue, and wash it down with a little water. The hot bath, the hot air bath, or hot pack should be used, and a hypodermic injection of pilocarpine may be given, with the precautions before mentioned. When the arterial tension is high, one-hundreth of a grain of nitroglycerine may be administered hypodermically; or,

better still, venesection should be tried, the amount of blood abstracted being regulated by the effect upon the pulse. In a robust adult, ten to twenty ounces from the arm may be taken, the usual amount being four or five. Furbringer (Eulenberg's "Real-Encyklopädie", p.482) cautions us to be very careful of venesection in cases showing cardiac weakness, or of general anaemia, and especially in young children who have been weakened by the original disease. Henoch withdraws a small quantity of blood from healthy children only. Leeches may also be applied to the temples, or over the mastoid processes, and when the urine is suppressed, an incision through the capsule of the kidney may save life. The patient, if able to swallow, should be encouraged to drink hot water; hot fomentations applied to the loins, and cupping should be tried, and an enema of one or two pints of warm water may be given; but if the breathing becomes embarrassed, or if convulsions occur, chloroform must be administered at once, and repeated as may be necessary. Chloral, alone or in combination with bromide of potassium, may be given by the mouth, or, if the patient cannot swallow, by the rectum, or morphine - one-twelfth to one-quarter of a grain - may be given hypodermically.

When coma appears, saline fluids should be given by subcutaneous injection, and it is also necessary that they should be given to compensate for the loss of fluid which results from free perspiration or venesection.

Jaccoud found that a sojourn in compressed air lessened the toxicity of the urine one-half, so in uraemic intoxication he recommended the inhalation of about ten litres of oxygen three times a day.

When there is much cardiac weakness, we must give digitalis, strophanthus, caffein, ether, musk, etc., and if pulmonary oedema supervenes (although, as a rule, when this occurs the case is fatal) we should administer digitalis, strophanthus, strychnine (nux nomica), and ether. In addition we may employ dry cupping and counter-irritation to the chest, oxygen inhalations,

whilst venesection, in sufficient amount to relieve the right side of the heart, should be tried.

During the period of convalescence the utmost precaution should be taken to guard against a relapse. The patient should be kept in bed for at least one month from the beginning of the attack, and then only allowed up if the albumen has disappeared, or exists only as a trace. Flannel should be worn next the skin, and after he has been up for a fortnight or so, he may be allowed out of doors, even if there is a trace of albumen, provided the weather be warm. Gentle exercise only must be permitted, and care should be taken to avoid a chill, and if all goes well, he may be sent in due course to some warm health resort - e.g., Falmouth, Madeira, Canary Islands, Azores, or the West Indies.

When the patient is improving, as is shown by the fall in the blood-pressure, disappearance of the oedema, normal temperature, increase in the amount of urine excreted, decrease in the amount of albumen, and the disappearance of haematuria, we may allow bread and butter, farinaceous puddings, and white fish, and if still improving in the next fortnight, a little meat and vegetables may be allowed, followed by a gradual return to an ordinary dietary. Tea and coffee may be given; but stimulants should be forbidden, and no butcher's meat should be allowed until the albuminuria has disappeared. Ripe and cooked fruits are permissable.

In those cases where the albuminuria is persistent, we may allow a couple of boiled eggs a day, to replace the albumen which is lost. As a rule, in such cases, anaemia is a prominent symptom, and when the patient is given some preparation of iron, a rapid improvement in his condition follows.

During the convalescence of nephritis ferruginous medicines are of great value; we may prescribe the tincture of the perchloride of iron, in doses of ten to fifteen minims, three times a day, and it may be combined

with dilute phosphoric acid. Of the other preparations we may use, the citrate of iron and quinine, the citrate of iron and ammonia, the syrup of the iodide of iron, and the compound syrup of the phosphate of iron. Basham's mixture is frequently used in America. It is made up as follows:

Tincture of the chloride of iron ..	2 parts.
Dilute acetic acid	3 "
Spirit of mindererus	20 "
Elixir of orange	10 "
Glycerine	15 "
Water	50 "

The dose is one to eight drachms, well diluted.

As a rule, the albuminuria passes away, but sometimes it is persistent, showing permanent impairment of some part of the renal tissue. These patients should pay strict attention to clothing, habits, and diet, and should reside in a warm climate - e.g., Falmouth, the Azores, Channel Islands, Scilly Isles, Egypt, or the Riviera.

SURGICAL AND PUERPERAL SCARLET FEVER.

Here prophylaxis is much more important than treatment. In the puerperal form, we should try Marmoreck's antistreptococcic serum.

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APPENDIX.

RETURN CASES.

Dr A.G.R.Cameron, Medical Investigator for the Metropolitan Asylums Board, has published a report on return cases of scarlet fever which occurred in connection with patients discharged from the Board's Fever Hospitals from July 1901 to July 1902. According to this report, there were 16,702 patients discharged from hospital during those thirteen months, and of these, 688 (4.1 per cent.) were supposed to be "infecting cases", i.e., they infected, or were alleged to have infected, others. The "return cases", calculated on the total discharges, numbered 949 (5.6 per cent.), but 30 of these were subsequent to the discharge of patients who had suffered from diphtheria only, and if these are deducted, the percentage of "infecting cases" would be 3.9, instead of 4.1.

Of the "infecting cases" it appeared that in only 279 (40.5 per cent.) could absolute proof be obtained that they were the cause of "return cases", whilst in 155 (22.5 per cent.) it was proved that the infection was derived from some other source and these cases were mere coincidences. The remaining 254 (36.9 per cent.) were looked upon as doubtful, owing to insufficient evidence being obtainable.

The report shows that 46.8 per cent. of the "return cases" occurred within one week of the discharge of the "infecting case" from hospital; 26.5 per cent. during the second and only 11 per cent. during the third. After this time the number of cases showed a rapid diminution, and practically ceased after the 8th week.

With regard to the period of detention in hospital, he came to the conclusion "that the period of detention has a marked influence in reducing the number of "infecting cases', and consequently, that long detention is not a cause of "return cases'". Those hospitals which detain the patients the longest have, on the whole, the least number of "infecting cases", but a long detention does not

necessarily ensure favourable results. According to Dr Cameron's tables, the proportion of "infecting cases" was practically the same whether the patients were discharged under, or over eight weeks, but of the latter, those who were detained the longest give the best results, e.g.

under 8 weeks.	4.1	per cent of "infecting cases"
8 to 12 weeks.	4.6	" " "
12 weeks and over.	3.2	" " "

Those who were discharged under 8 weeks would be uncomplicated cases; those after, would, in all probability, have suffered from some complication e.g. adenitis, tonsillitis, rhinorrhoea, nephritis, etc., and he states that, apart from the condition on discharge, when a patient suffers from complications in hospital, he is much more liable to be a cause of a "return case", than one, in whom the disease ran an uncomplicated course, and to account for this he says, that not only do the complicated cases retain their infection longer than the uncomplicated, but in them the infection is more virulent, and as a result of prolonging the period of detention, there is a diminution, both of the infectiousness of the disease, and the virulence of the infection. It is believed by most authorities that certain complications, e.g. nasal discharge, may be infectious, but up to the present, there has been no evidence forthcoming to show that all of the complications are so.

"Return cases" may occur at any period of the year, but appear to be much more numerous from November to April, although from February to April there was a smaller number of patients under treatment. The increase in the number of "return cases" commences rather suddenly, and ends just as abruptly. This increase could not be due to over-crowding, as the "infecting cases" did not decline with the number of patients under treatment, and it certainly could not be attributed to any laxity in discharging, as the maximum increase was not when the greatest number of patients were under treatment.

The largest number of "infecting cases" occurred when the disease was least prevalent, and vice versa, and

although this might possibly be due to a difference of the type of case treated, the more probable explanation is that climatic conditions, i.e. the cold of the winter and early spring months, play an important part. Dr Cameron shows that 187 "infecting cases" suffered from a mucous discharge within two days after leaving hospital, and these cases were twice as frequent during the months from November to April inclusive, as they were from May to October. In all probability this accounts for the higher number of "infecting cases" during that period.

According to the comments of the Medical Officers of the Board's Hospitals, Dr Cameron's statements are incorrect. They consider the largest monthly number of "return cases" occurred in December, and the largest three-monthly number occurred from November to January. The time of least monthly prevalence was February, and of least three-monthly prevalence was February to April, and the greatest infectivity rate for any three-monthly period was also from November to January. They also state that, not only was the largest daily average under treatment during November, but in that month also, the largest number of "infecting cases" and the third largest number of "return cases" occurred. They consider that there is no close correspondence of the infectivity rate with either the number under treatment, or the number discharged.

The "infecting cases" are usually between the ages of 5 & 10 years; after this time the tendency to carry infection is greatly lessened, and it is very rare for an adult to be the cause of a "return case". According to Cameron morbid conditions of the nose are more frequently found between the ages of 5 & 10 years, but the Medical Officers of the Boards' Hospitals state that in "infecting cases" nasal discharge is slightly more common in proportion under 5 years of age. The largest number of patients discharged with otorrhoea were under 5 years of age, but between the ages of 5 & 10 years, a relatively larger number of such cases are associated with the occurrence of "return cases", frequently a morbid condition of the nose being co-existent. Over 10 years of age, desquamation is the common morbid condition associated with "return cases".

In the majority of instances, the age of the "return case" was under 5 years, whilst the case mortality was 5.8 per cent. This was higher than that for all cases, which was 3.6 per cent, and he also states that this higher mortality affected all ages, and increased with the age of the patient.

Superadded Diseases. - Whilst making enquiries as to the causes which tend to prolong the period of detention in hospital, Dr Cameron found that 5 per cent. of the total number of scarlet fever admissions contracted an infectious disease, other than the one for which they were admitted. In these cases the average period of detention was 98.7 days, as compared with 64.5 days for all cases.

Disinfection of the house did not appear to have any appreciable effect either upon the number of "return cases", or on the "secondary cases" which occur at varying intervals after it has been carried out. According to him, these "Secondary cases" are not due to defective disinfection, as many "were infected before the removal of the " primary case ", or if subsequent to removal, either from the same source as the "primary case", or, what I believe was more common, from an unrecognised case." He concludes

"1.That persons suffering from sore throat, or other anomalous illnesses, may convey scarlet fever infection to others.

"2.That there may be a latent period after the reception of the infection, and the onset of the illness.

"3.That, after the reception of the infection, and before the appearance of the rash, patients may suffer from an illness lasting considerably longer than the usual period of invasion.

"4.That without having previously suffered from this disease individuals may act as carriers of scarlet fever infection, and continue in normal health"

Clinical Conditions of the Infecting Case".

A morbid condition of the nose was the complication most frequently present after discharge in "infecting cases",

and was the most frequent cause of "return cases". In many (67 per cent) a nasal discharge was first noticed within a fortnight of the patient's discharge from hospital, and Dr Cameron makes the statement that, a non-purulent rhinorrhoea is not so infectious as the purulent form, or a rhinitis. This is doubtful for a non-purulent rhinorrhoea may become purulent in a day or so. He also states that the discharge from the nose is not necessarily infectious per se, but in a very large proportion of the cases, its presence, especially when purulent, is an almost certain indication that the patient is infectious.

He does not think that morbid conditions of the throat, enlarged glands, and otorrhoea, are of primary importance in causing "return cases". Of 361 cases of otorrhoea, 54 were proved to be "infecting cases", and in 21 cases of these the discharge appeared after discharge from hospital. The majority of the other 33 had been detained in hospital for about 12 weeks, and as other morbid conditions, especially of the nose co-existed, he attaches more importance to the latter as being the cause of the "return cases".

He concludes that the late desquamation is not infectious, as 1361 patients were discharged with evidence of desquamation, chiefly on the feet alone, and only 94 were associated with "return cases". In 70 of these other morbid conditions were present, and in 24 only did desquamation exist alone.

Affections of the scalp and ears,— impetigo, eczema auris, were associated with "return cases", especially those accompanied with morbid conditions of the nose.

His conclusions are as follows:-

" Cases might be infectious in which no morbid condition can be detected, and patients who have suffered from complications, may continue to be infectious for some time after all the objective signs of these complications have disappeared.

"The "infecting cases" which retain their infection longest, are those which suffer from (certain)"secondary" complications.

"Patients suffering from a morbid condition of the nose may continue to be infectious long after removal from the hospital environment, and consequently, separate isolation of these cases for a period of 10 days before leaving hospital, if efficacious at all, can only be so to a limited extent.

"At the time of discharge the infection may in some cases be in an active state; in others it is probably quiescent, and remains so for sometime after leaving hospital.

"The occurrence of a nasal discharge for the first time after returning home, or the recurrence of the discharge which had ceased some time before the patient left hospital, is apt to be attended by what appears to be a recrudescence of infection, and similarly, but not so frequently, the occurrence after discharge of other complications such as tonsillitis (sore throat) may be followed by "return cases"

"That the secondary complications which occur in hospital during convalescence, may at times represent abortive relapses of the disease, and be analagous to the recrudescence of infection which takes place out of hospital." This statement is disputed by some, who say that " it is not true of all, though it may be so, of some of the complications."

"The intensity of the infection appears to bear some relation to the nature and duration of the complications, e.g. if the discharge from the nose be purulent, nearly all the persons unprotected by a previous attack who come in contact with the "infecting case" contract scarlet fever. The type of illness is usually sharp, and the "return case" seldom escapes without severe "secondary" or "septic" complications. Adults and the less susceptible members of the family who are infected, suffer from sore throats, but the severity of the illness, and the prostration which not

infrequently follows, suggest that the illness is not an ordinary abortive attack of scarlet fever but probably a mixed infection."

If the discharge be non-purulent, or has become chronic, the "return case" may not be infected until after a long "interval", although, during this time he may have been in intimate contact with the "infecting case". In these cases it has been suggested that the virus has become attenuated.

Those cases which have been detained for a short period owing to the mildness of the attack, and whose condition on leaving the hospital is either quite normal, or presents a chronic morbid condition of the throat (enlarged tonsils, adenoids) usually cause only one " return case ". Their infection seems to pass off rapidly, and in most instances there must have been very close contact with the "infecting case" i.e. the child who occupies the same bed is the one to be infected.

"The Etiology of Return Cases." It is difficult to determine to what extent "return cases" are dependent upon hospital conditions, and what is the nature of the infection associated with their origin. In both instances a definite opinion cannot be formed, as the available evidence is not conclusive.

Cases treated at Home. -"Return cases" occur in connection with patients treated at home, but are rare in comparison with those arising in connection with cases treated in hospital. This is singular, as in home-treated cases, the period of isolation is usually shorter than in hospitals, - about six weeks, - and one would suppose the disinfection of the patient would not be carried out so thoroughly in private as in hospital. Again we would naturally think that in some of the home-treated cases, as well as those treated in hospital, the period of infectivity would be prolonged, and many of the unprotected children who had escaped the infection at the time of outset of the first illness would contract the disease after the home isolation was completed. As a rule the home-treated patient belongs to a better social class than those treated in Hospital, and the former have on an average fewer children in a family, and they usually occupy separate beds.

In Manchester, in 1901 (Report of the Health of the City of Manchester, 1901, p. 56), in 358 houses where cases were treated at home, no further cases occurred after isolation was declared over, although amongst 351 children unprotected by a previous attack, and therefore presumably susceptible, there were only 69 secondary cases, all of which with one exception occurred within 31 days from the outset of illness of the primary case.

In Providence, U.S.A.(Public Health, vol.8, November, 1895), the patients are treated at home, and in some households the unprotected children are sent away until the period of isolation is over. On the return of 317 of these children, who were at once removed from the houses where the outbreaks of scarlet fever had occurred, only 18 were attacked.

Cases treated in Hospital. It has been suggested that "the prospective "infecting case" derives from the acute cases and accumulates in his nostrils extraneous infection which he may transmit after he leaves the hospital environment." Those who agree with this theory look upon "return cases" as being essentially peculiar to hospitals, and think if there be any connection between the nasal discharge and the continuance of the infectiveness, the discharge is only of secondary importance. In their opinion the mucous discharges, not only act as suitable media for the growth of the micro-organisms, but also are carriers of any possible infection that may come in contact with them, although at the same time they do not appear to possess infectious properties in themselves. When the secretion dries up, there is no longer any medium upon which the micro-organisms can engraft themselves, and so the patient becomes non-infective. If the discharge continues, it depends whether the patient remains in an infective ward as to how long the infection will remain. If this theory be correct, then the longer he remains in hospital, the more infectious he will become.

Another theory is " that the "infecting case" at

the time of discharge has not eliminated his own infection derived from his original attack, in consequence of the process of elimination being retarded by the surcharging of the atmosphere with infection, by the aggregation of [redacted] patients." Those who agree with this theory consider that aggregation of cases, either acute or chronic, is of great importance in the casuation of "return cases", and the effects of this aggregation depend more upon the type of cases under treatment, and also upon the season of the year, than upon any atmospheric condition of the ward. When the ventilation is perfect, and the floor-space per bed is adequate, the atmosphere could hardly become vitiated to such an extent to retard the elimination of the infection, but in many cases treated at home the ventilation is not so good as in hospital, and yet they are rarely associated with "return cases". When the cases are mild, and the weather favourable enough for the convalescent patients to pass a great amount of time in the open air, the elimination is aided, even if there may be some overcrowding in the wards, but if cases showing complications, or those with a severe type of the disease are admitted into an overcrowded ward, ill effects are sure to follow, even if the convalescents are able to be out of doors. He says that a septic case admitted into a ward, where there is no strain upon the accomodation, may infect a convalescent child who may be in the next bed, and such examples are frequently seen in the hospitals belonging to smaller sanitary districts. The Medical Officers of the Boards' Hospitals do not agree with this statement, and in the Swallownest Hospital, where we have to admit all acute cases, whether mild, septic, or toxic, into the same ward, I have never seen it to occur amongst the 398 cases which have been treated there, although nearly all the time we were overcrowded. In December 1905 we had an outbreak of adenitis, in some cases associated with albuminuria, in a ward which was occupied only by cases which had been under treatment for one month.

Some believe that complications are much more common in old hospitals than in new, and in cases treated at home, not only do the complications occur less frequently, but the period of convalescence is shortened.

If the second theory be correct, then it is necessary to prevent the spread of complications in hospital, if we are to limit the number of "return cases", and according to Dr Cameron, the patients receive this superadded infection most frequently during the acute stage soon after admission, though it may take place any time during their stay in hospital. At the same time it is difficult, or even impossible, to say whether the complications which arise during the course of the illness are due to infection present at the time of admission, or received subsequently.

He thinks that owing to a general lack of vigour on the part of the patient, or when a local septic infection is superadded, the mucous membrane affords a suitable nidus for the development of the micro-organism of scarlet fever. It is not necessary for the mucous membrane to show a morbid condition, for some "infecting cases" show no sign of local disease, and although a discharge may assist in distributing the infection, it is not essential to the patient's infectiveness. In those cases where the soil is suitable, the micro-organisms will retain their vitality for a considerable period of time, but in the majority of cases the soil soon becomes unsuitable, and the infection dies out.

He also states " that after exposure to cold or variations of temperature, such as may occur after a warm bath in winter, the septic organisms become active in the mucous membrane, and the vital resistance of the latter is thereby still further lowered."

Prophylactic Measures - If the second theory be correct, we should endeavour, in the first instance, to place the patient under the best possible hygienic conditions, so as to rapidly renew his bodily vigour, and secondarily, to shield him against those secondary infections, and also against the factors which predispose to them. To do this, each patient should be isolated separately for a period of two or three weeks, after

which time the uncomplicated cases could be sent to the general wards. Complicated cases should remain isolated separately, or sent to wards which are partitioned off in such a manner as to prevent the patients from coming in contact with each other. Chronic cases of mucous discharge should be allowed to be in the open air as much as possible. In all cases aseptic precautions should be rigorously enforced. These methods would prove very expensive.

He also suggests that, as mucous discharges frequently follow the discharge bath, it would be advisable, especially in the winter months, to discontinue the practice of giving a warm bath on the day of discharge from the hospital to those patients who have suffered from, or who are predisposed to this discharge. He recommends it to be given on the evening prior to discharge, and if no discharge ward be provided, there will be little risk of causing a "return case" if the patient be put into clean sheets, and wear a cap to protect the hair after the bath.

If the theory of accidental infection be correct, then the acute and convalescent patients should be separated as far as possible, and those who are to be discharged, should be passed through a series of convalescent wards, which should be disinfected at regular and short intervals. Patients suffering from mucous discharges should be isolated separately for a period of not less than one month, and during that time the ears and nose of the patient should be thoroughly douched night and morning.

UROTROPIN IN SCARLET FEVER.

I have given urotropin in another series of 167 cases, making 223 in all. No untoward symptoms were noticed except in one, a girl of four years, who was admitted suffering from an attack of simple scarlet fever. One and a half grains were administered to this patient three times daily in two ounces of water, and on the third day an urticario-erythematous rash was noticed on the legs, arms, and trunk, but not on the face. It was attended by much itching, and lasted about forty-eight hours. The urine did not contain blood or albumen.

Of the other cases, three were admitted with albumen, (febrile albuminuria); 2 developed "Scarlatinal albuminuria", one on the 20th, the other on the 27th day of the disease; four developed slight albuminuria whilst suffering from adenitis, and one whilst suffering from otorrhoea. The urine of two other patients contained a faint trace of albumen for one day during the third week. Leaving these two and the three who were admitted with febrile albuminuria out of the count, we have 7 cases with albuminuria out of 233 in which urotropin was administered. This gives a percentage of 3.13 as against 3.52 (Caiger)

DIET IN SCARLET FEVER.

On February 2nd 1906, Guinon and Pater read a paper at a Meeting of the Paris Hospitals Medical Society on the results obtained by them in treating scarlet fever patients with a chloride-free diet. The patients were children between the ages of five and ten years, and for treatment, were divided into two groups. One group was kept upon an absolute milk diet, but the other group, as soon as the temperature fell to the normal (usually from the fourth to the sixth day of the illness), was put upon a chloride-free diet. They found that the children in the latter group passed urine frequently, and the amount of urea eliminated was much greater than in those who were upon the milk diet. Further, they also noticed that these children convalesced more rapidly, and put on weight much more quickly, whilst no case showed albuminuria.

Dufour also gave his experiences. It appears, out of 375 cases which came under his observation, only

six died, and he came to the conclusion that these good results were due, in part at any rate, to a solid diet, which although made up of various elements, contained only a limited amount of chloride. One case developed nephritis, and she died. He states that other patients had traces of albuminuria, but this alway cleared up when the patient was kept in bed, and when chlorides were omitted from the diet.

HYDROTHERAPY

In the Medical Chronicle of September, 1904, R. W. Marsden recommends hydrotherapy in the treatment of scarlet fever. He says that in cases where there is no danger of producing cardiac failure, short cold baths, repeated at frequent intervals, or such substitutes as the cold pack with friction, or the cold mitten, or rubbing rapidly with ice, should be adopted, and often the greatest benefit follows. In delicate patients, children, and in those cases where it is thought cardiac failure may supervene, he recommends the lukewarm bath, and says its duration should not exceed ten or fifteen minutes, as a prolonged tepid bath causes a weak pulse, and is very injurious. Whatever method is adopted, "it is necessary that the application should be regularly and frequently repeated during the period of pyrexia or marked toxaemia, and that each application should be adequate to the severity of the case"

TREATMENT OF OTITIS MEDIA.

In the Medical Record of February 25th, 1905, Jerecky discusses the treatment of the ear complications of scarlet fever. For the relief of the pain in the early stages of the disease, he considers irrigation with hot water to be the best treatment. He uses from a pint to a quart in a douche jar, which is held about a foot over the head. In some cases morphia given by hypodermic injection may shorten the attack, whilst in others, leeches applied to the tragus may give great relief. He has also found chloroform vapour, when blown into the meatus, watery solutions of atropine or cocaine, or tincture of opium when instilled into the canal, to have beneficial effects, but he objects to the use of oleaginous preparations. If the pain still persists

when these remedies have been tried he states, that if the tympanic membrane be examined, it will probably be found to be bulging, usually at the postero-inferior segment, and he recommends the immediate performance of paracentesis. This should be done under general anaesthesia, especially in older children and adults, and he considers nitrous oxide, or ethyl chloride to be the best for the purpose. In his opinion local anaesthesia is unsatisfactory. In addition he advises incision of the mucous membrane of the internal tympanic wall and the postero-superior canal for one quarter of an inch.

If the membrane has ruptured spontaneously, and if, on examination, the opening does not appear large enough to admit of free drainage, he advocates enlarging the perforation. After the operation he irrigates with a solution of perchloride of mercury (1 in 5000), and packs the canal lightly with sterilized gauze, the ear being carefully dried. This is repeated daily.

DISEASE.

Scarlet Fever.
(Second attack)

Notes of Case.

Name Stanley Biddlewsm.

Age 11 years.

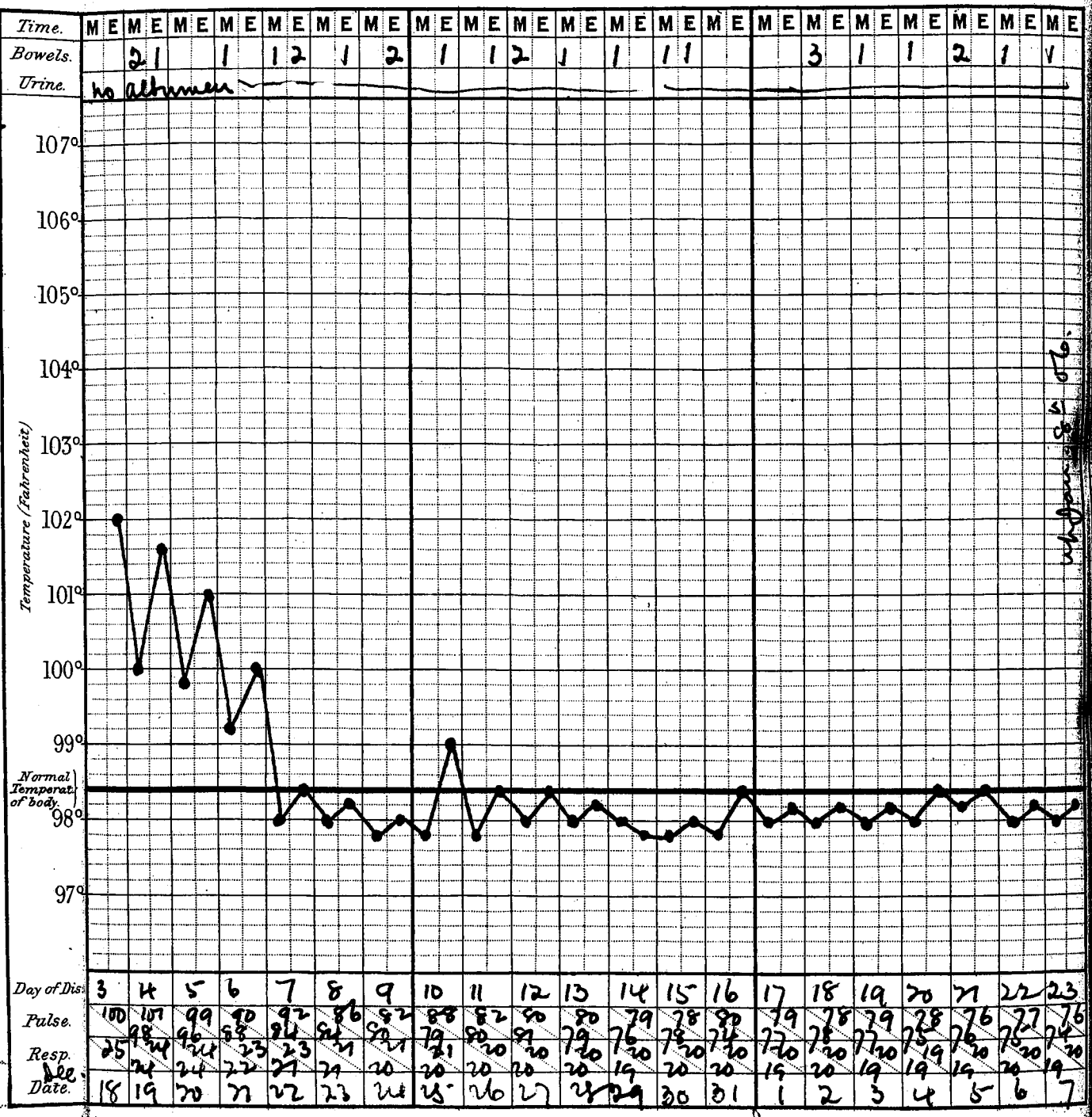
Diet

Case Book N°

No. 27.

Date of admission.
December 18th 05

Result Feb. 8th 1906.



Entered at Stationer's Hall. *Printed and Published by Wodderspoon & Co. 6, Gate Street, Lincoln's Inn.* *Gould's Clinical Chart.*

Case No. 26. Eric West. aged 10 years. was

to the hospital the temperature was 102° F, pulse 100, and respirations 25. The urine was free from albumen. There was nothing of any importance to record during the attack; desquamation was first noticed on the neck on Decr. 21st, there were no complications, and he was allowed up on January 8th 1906. He was discharged from hospital on February 8th 1906.

DISEASE.

Scarlet Fever.

Notes of Case.

Name Eric West.

Age 10 years.

Diet

Case Book N°

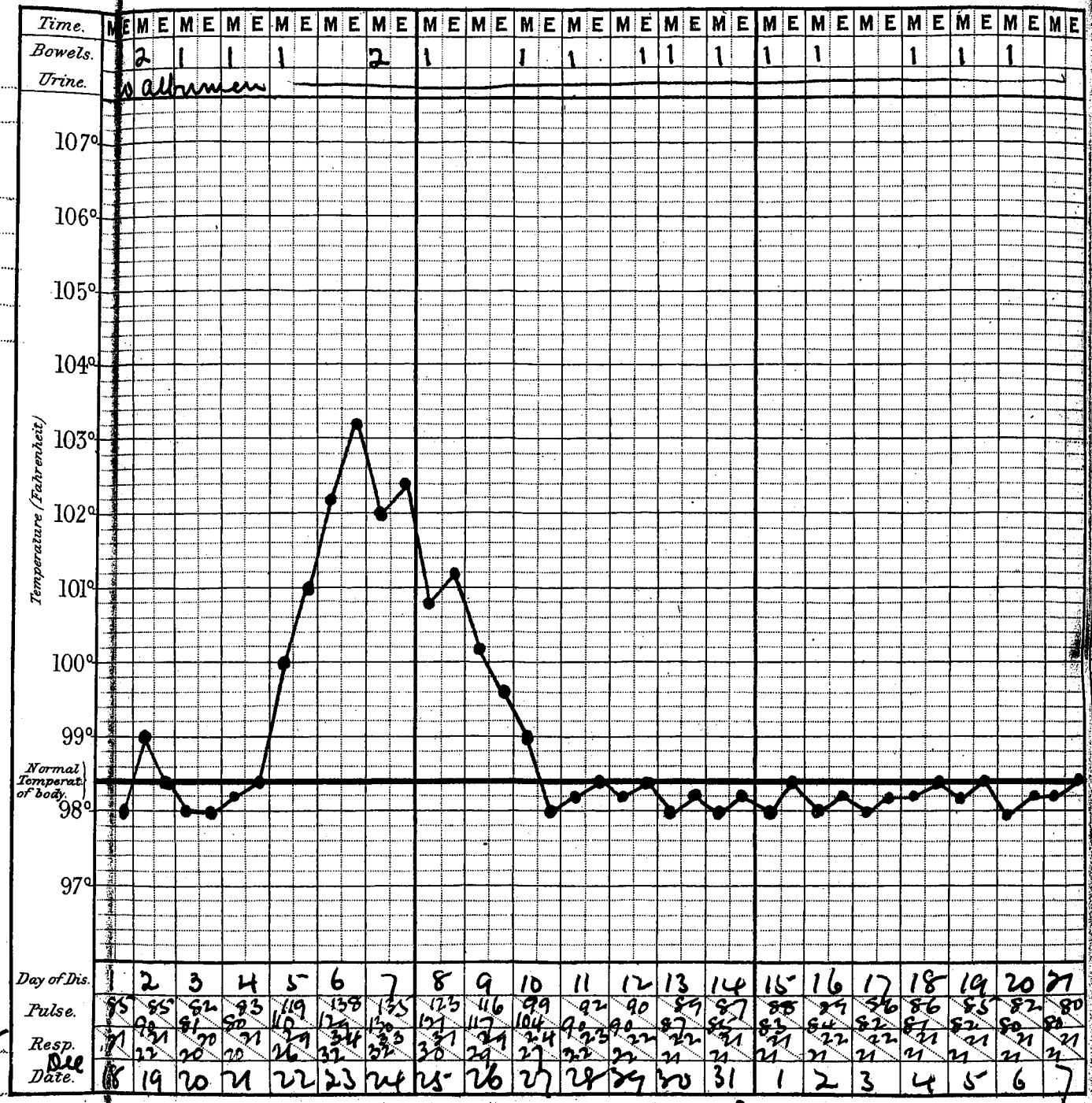
no. 26.

Date of admission.

December 18. 1905

Result Discharged

Feb. 13th 1906.



Entered at Stationer's Hall. Printed and Published by Wodderspoon & Co. 6, Gate Street, Lincoln Inn. Gould's Clinical Chart.

Case No. 26. Eric West, aged 10 years, was admitted into hospital late in the evening of December 18th 1905, along with an elder brother, who showed a well marked rash. (According to the history, the latter began with sore-throat, vomiting, and feverishness on December 16th, the rash appearing next day). On admission the temperature was 98°F, pulse 85, respirations 21, there was no rash but he complained of sore-throat, and as he lived at a dairy, the medical attendant thought it advisable for him to be sent to the hospital. Unfortunately he was sent to the scarlet fever pavilion (as the Matron had been notified that it was a case of scarlet fever), but next morning when I saw him, I ordered him to be sent to the isolation wards as although his temperature was 99°F he did not appear to have any scarlatinal symptoms. On the morning of December 22nd, the temperature was 100°F, pulse 110, respirations 26, and he complained of sore-throat, and vomiting, and in the evening the rash appeared. The illness ran its usual course; desquamation began on the face on December 27th, there were no complications, and he was discharged on February 13th 1906.

I record this case, as it is possible to arrive at the precise period of incubation. If he were infected by his brother on December 16th, that period would be 6 days; if he were infected in the hospital (which is very probable) the duration of the incubatory stage would be three days.

SECOND ATTACK

Case No. 27. Stanley Widdowson, aged 11 years, was first seen by me on December 18th, 1905. He had a well-marked scarlatinal rash, which was first noticed on the chest on December 16th. The illness began on the previous day, with sickness, sore-throat, and feverishness. The fauces showed the typical enanthem, and the tongue was the red strawberry. On admission to the hospital the temperature was 102°F, pulse 100, and respirations 25. The urine was free from albumen. There was nothing of any importance to record during the attack; desquamation was first noticed on the neck on Decr. 21st, there were no complications, and he was allowed up on January 8th 1906. He was discharged from hospital on February 8th 1906.

I attended this boy three years ago during an attack of scarlet fever, which ran an ordinary course. In all probability the present attack was a "return case" as his brother was discharged from hospital on December 4th 1905 (11 days before the initial symptoms showed themselves) This brother had been kept in hospital for twelve weeks, although he had finished desquamating at the end of the eighth week, on account of a sore on the left heel, caused by his boot. The "infecting case" did not suffer from any complications when in hospital; the sore was completely healed and there was no scab, neither did he develop any morbid conditions, e.g. rhinorrhoea, otorrhoea, after his return home.

RELAPSE.

Case No. 28. James Jackson, aged 8 years, admitted into hospital on November 16th, 1905. The illness began on November 13th, with feverishness, sore-throat, and vomiting, and the rash appeared next day. On admission he was found to be suffering from an ordinary attack of scarlet fever; the fauces were reddened and showed the typical enanthem, but there were no patches upon the tonsils, the tongue was the typical red strawberry, and the submaxillary glands were slightly enlarged. The temperature was 102°F, pulse 130, and respirations 31. The urine did not contain any albumen. There were no complications, desquamation began on the neck on November 21st, and he was allowed up on December 7th. He was convalescing favourably until the evening of December 21st, when he complained of sore-throat, and next day a typical scarlatinal eruption was noticed on the chest which spread to the back and extremities. The tongue and fauces were characteristic of scarlet fever, and the submaxillary glands were enlarged, but the urine did not contain albumen. There were no complications, desquamation occurred as usual, being first noticed on December 24th on the cheeks, and he was discharged on January 29th, 1906.

Case No. 29. Lucy Winder, aged 4 years, was first seen by my partner on January 14th 1906. According to the history the child began with feverishness, sore-throat, and vomiting, on the previous day, and the rash appeared the same evening, and on his visit she showed all the symptoms of a mild scarlatinal attack. She was admitted into hospital on January 15th. The temperature was 99°F,

DISEASE.

Scarlet Fever.

Diphtheria.

Notes of Case.

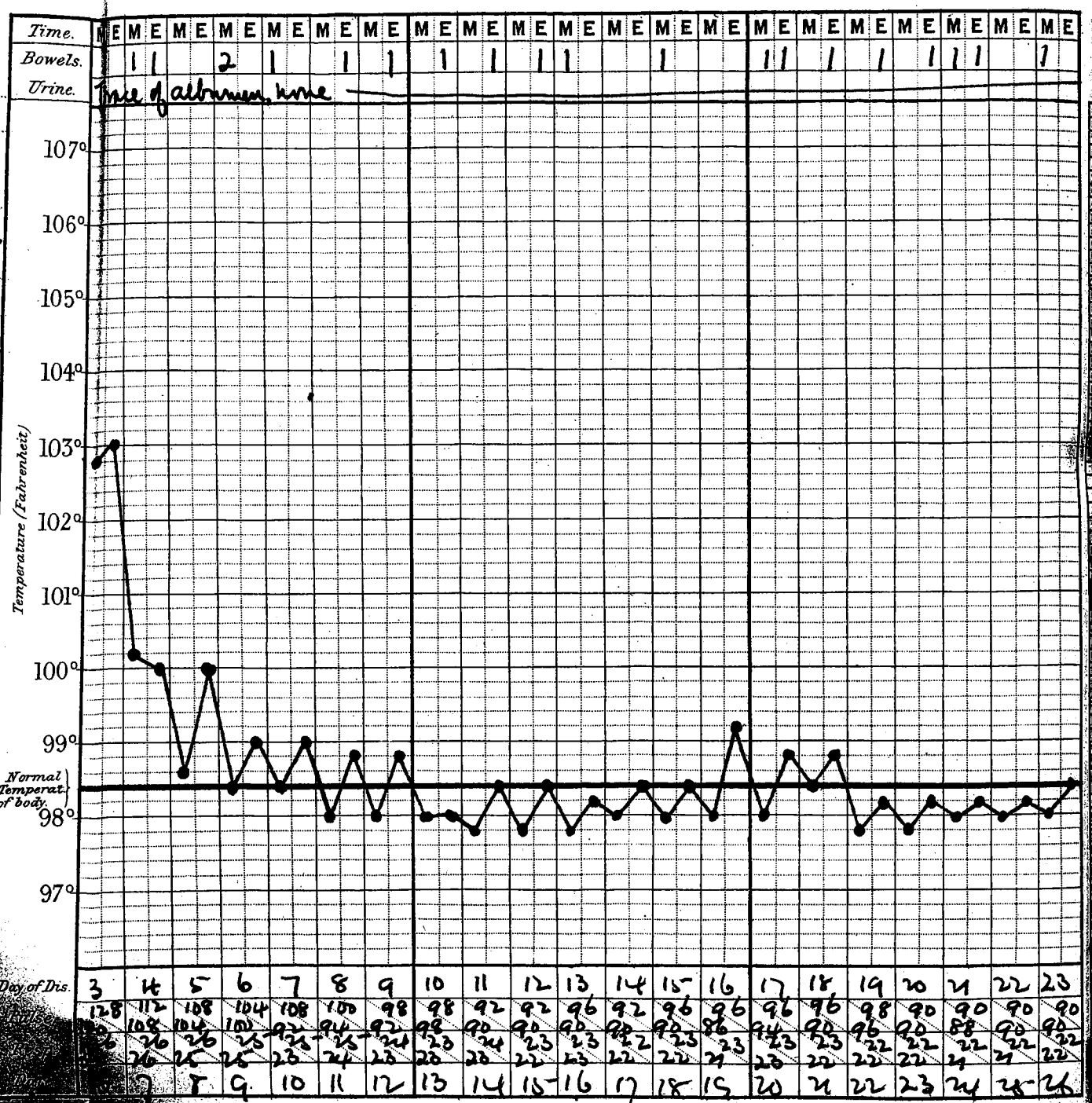
Name Annie Skerrington.

Age 7 years.

Diet

Case Book N°

No. 30.



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pulse 106, respirations 26, and rash was only faintly developed. The urine was free from albumen. Desquamation was noticed on the neck on January 19th. The temperature

disappeared by the evening of January 8th. The urine was free from albumen on the 9th, and the same evening an urticario-erythematous rash was noticed upon the legs and trunk. This was attended with much itching, but had

DISEASE.

Scarlet Fever
Relapse.

Notes of Case.

Name { Lucy
Winder.

Age 4 years.

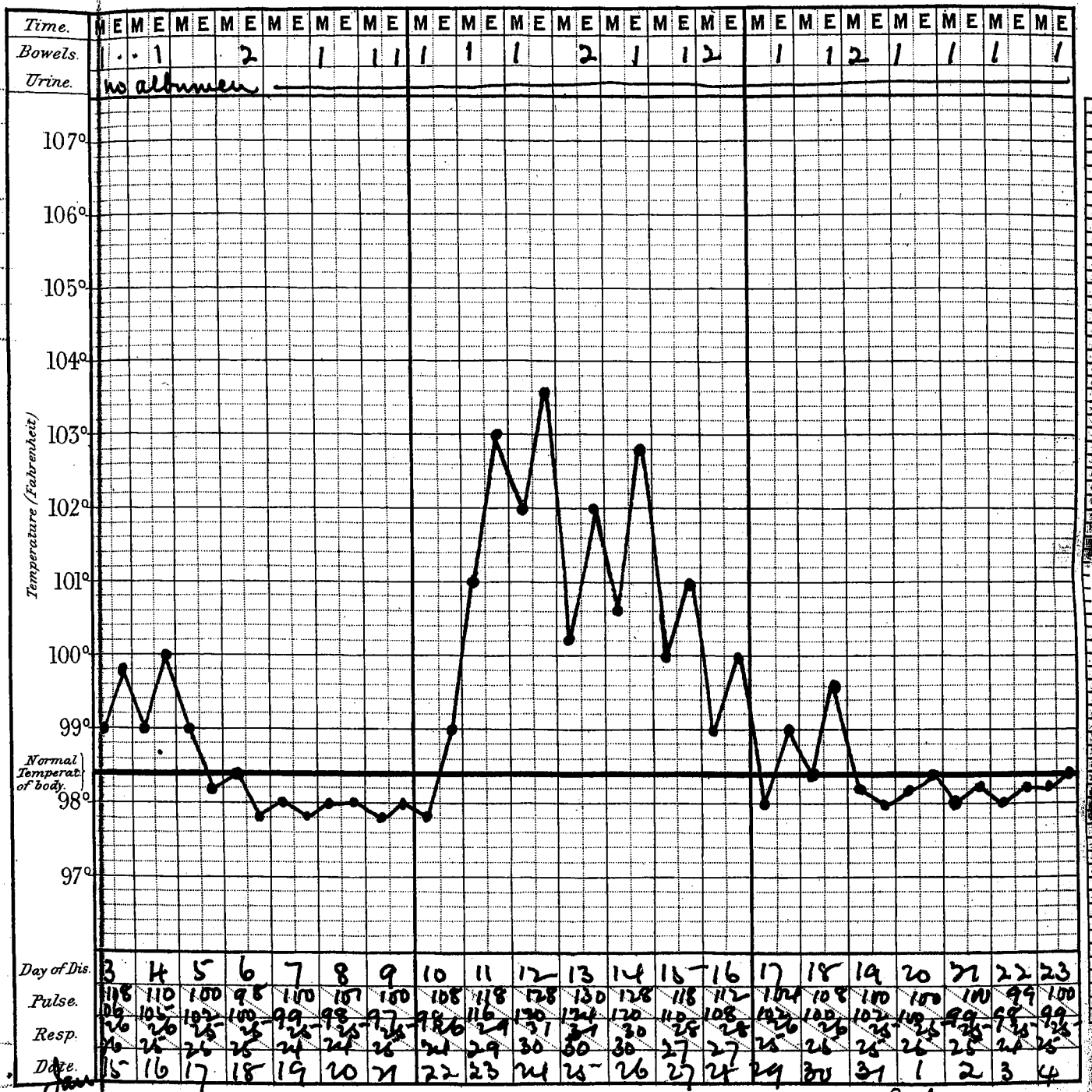
Diet

Case Book N°

No. 29.

Date of admission.
January 15th 06

Result March 9th 06.
Discharged.



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pulse 106, respirations 26, and rash was only faintly developed. The urine was free from albumen. Desquamation was noticed on the neck on January 19th. The temperature which fell to 98.2°F on the evening of the 17th, remained either normal or subnormal until the evening of the 22nd, when it rose to 99°F. Next morning it was 101°F, and the child complained of sore-throat, and vomiting, and the same evening a typical scarlatinal eruption appeared upon the chest, which spread to the extremities and back the next day. Desquamation was noticed upon the cheeks on the 29th, and next day, an enlarged gland was noticed beneath the angle of the jaw on the right side. The temperature was 98.2°F. on the morning of the 31st; the glandular enlargement had disappeared a week later, and there were no other complications. She was discharged on March 9th, 1906.

SCARLET FEVER AND DIPHTHERIA.

Case No. 30. Annie Skerrington, aged 7 years, admitted into hospital on January 6th, 1906. According to the history, the initial symptoms - vomiting, sore-throat, and feverishness - began on the morning of January 4th and the rash appeared the same evening. On admission the rash was well marked on the trunk and extremities, and on the outer sides of the thighs presented a coarsely papular appearance. The temperature was 102.8°F, pulse 120, respirations 32, and the urine contained a trace of albumen. The tongue was atypical, and covered with a dirty yellow fur, and both tonsils were covered with membrane of the same colour, whilst the left side of the uvula showed a similar patch. I happened to be present in the Ward when she was admitted and as the condition of the throat pointed to diphtheria she was at once sent to an observation ward, and 3,000 units of diphtheria antitoxin were injected. A swab of the throat was also taken, which upon examination confirmed the diagnosis, as the Klebs-Loeffler bacillus was easily demonstrable. Next day the membrane in the throat was loose, and had all disappeared by the evening of January 8th. The urine was free from albumen on the 9th, and the same evening an urticario-erythematous rash was noticed upon the legs and trunk. This was attended with much itching, but had

DISEASE.

Septic Scarlet Fever

Notes of Case.

Name Dorothy Seastrie.

Age 7 years.

Diet

Case Book No.

ho. 32.

Date of admission.

December 15th 1905

Result Died Dec. 21. 05

Time	M E	M E	M E	M E	M E	M E	M E
Bowels	1 1	2 1	1	1 1 1			2
Urine	no albumen						
Day of Dis.	3	4	5	6	7	8	9
Pulse	158 160	160 150	164 162	168 166	160 154	uncountable.	
Resp.	40 40	40 36	40 41	41 42	41 40		
Date	Dec 15	16	17	18	19	20	21.

Temperature (Fahrenheit)

105° 104° 103° 102° 101° 100° 99° Normal Temperature of body 98° 97°

Died 11 a.m.

Sponged.

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all disappeared by the 11th. Desquamation was noticed on the neck on the 14th. The subsequent course of the

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on the morning of the following day. On admission the child was in an extremely serious condition, the rash was dusky-red and copious, she had profuse nasal discharge, and the throat was swollen, its mucous membrane being of a dusky-red colour, and patches of a dirty yellowish membrane were to be seen upon the tonsils and uvula. The tongue

all disappeared by the 11th. Desquamation was noticed on the neck on the 14th. The subsequent course of the case was uneventful; she did not develop paralysis, or any other complication, desquamation finished on the feet on February 26th and she was discharged on March 1st, 1906. A swab of the throat taken on February 3rd, showed an absence of the diphtheritic bacillus.

SEPTIC SCARLET FEVER.

Case No. 31. Mary Whitham, aged four years, admitted into hospital on November 12th, 1905. According to the history her illness commenced with vomiting, sore-throat, and feverishness on November 11th, the rash appearing on the morning of her admission into hospital. The rash was well marked on the chest, back, and arms, but was only slightly perceptible on the legs. The tongue was covered with a dirty yellowish fur, and was never typical at any stage of the illness. The throat was reddened and swollen, the tonsils were enlarged, and on both of them and the uvula, dirty yellowish patches were to be seen. The submaxillary glands were enlarged and tender to the touch, the temperature was 102°F, pulse 122, and respirations 30. The urine did not contain albumen. The throat did not "clean" until November 24th, and she was progressing favourably until the 29th when she was seized with a severe attack of diarrhoea which fortunately proved amenable to treatment. Her convalescence was again interrupted on December 12th, when she had enlargement of the glands at the left angle of the jaw. The temperature never reached 100°F, but the glands remained enlarged for ten days after the temperature had become normal. She was discharged on January 8th, 1906.

Case No. 32. Dorothy Searstone, aged 7 years, admitted into hospital on December 15th, 1905. According to the history the illness began two days previously with sore-throat, vomiting, and feverishness, the rash appearing on the morning of the following day. On admission the child was in an extremely serious condition, the rash was dusky-red and copious, she had profuse nasal discharge, and the throat was swollen, its mucous membrane being of a dusky-red colour, and patches of a dirty yellowish membrane were to be seen upon the tonsils and uvula. The tongue

was reddish-brown and dry, the mouth was full of sticky mucus, and the submaxillary glands were enlarged and painful to the touch. The temperature was 104.6° F, pulse 160, and respirations 40. The urine contained no albumen. There was constant vomiting which persisted until the end, in spite of all treatment; she shewed all the signs of a septicaemia of the most virulent type, there was no improvement, and she died on the ninth day of the illness.

Case No. 33. Vera Pogmore, aged 2 years, admitted into hospital on December 4th, 1905. Her illness commenced with vomiting, feverishness, and sore-throat on November 28th, and the rash appeared the next day. On admission the temperature was 102.8° F, pulse 135, and respirations 36. She was an ill-nourished child, the arms and legs were covered with blotches of a septic character, the throat was swollen, and both tonsils and the uvula were covered with a dirty grayish coloured membrane. The submaxillary glands were very much enlarged, and the tongue was dry and red. Bacteriological examination gave negative results as regards the Klebs-Loeffler bacillus. The child suffered from a severe attack of the septic form of the disease, and a discharge was noticed from the right ear on December 7th, and from the left, four days later. Under treatment the throat somewhat improved, but was never absolutely free from patches, and although the temperature fell to the normal on the evening of December 15th, she seemed to be gradually losing ground. It was difficult to obtain urine for examination, but whenever we could do so, it showed a considerable amount of albumen, at one time about one-fifth. The child refused all nourishment, and so we had recourse to feeding by the nasal tube, but in spite of everything she became worse day by day, and was reduced to a skeleton. On the 25th vomiting, which could not be controlled, set in, and she died suddenly from heart failure on the morning of the 28th.

Case No. 34. Matthew Potts, aged 3 years, admitted into hospital on December 27th, 1905. The illness began with feverishness, sore-throat, and vomiting on December 24th, and the rash appeared next day. On admission the rash was bright-red, and well developed on

the trunk and extremities, the tongue was the red strawberry, the throat was injected and swollen, and the tonsils were enlarged, and showed a few dirty yellow patches. There was a copious thin nasal discharge, but the glands under the jaw were only slightly swollen. The temperature was 100°F, pulse 110, respirations 28, and the urine was free from albumen. The temperature fell to 98.6°F on the evening of December 29th, but rose on the next evening to 101°F, and it was noticed that the submaxillary glands were very much swollen. They remained about the same size for the next two days, but on January 2nd, they were noticed to have diminished in size, and the temperature was normal in the evening for the first time on January 4th. Two days later he complained of severe pain in both ears, and the left began to discharge on the 9th, and the right on the 12th. The discharge from the latter ceased on Jany. 17th, and from the left on the 21st. He was allowed up on the 24th, there were no more complications, and he was discharged on February 20th, 1906.

MALIGNANT SCARLET FEVER.

Case No. 35. Rose Storey, aged 11 years, was admitted into hospital at 12-30 p.m., on January 10th, 1906. According to the history the illness began on the evening of January 7th, 1906 with sore-throat, vomiting, and feverishness, and the rash appeared the next morning. On admission she was in a comatose condition, the pulse could not be counted, the rash was very dusky-red in colour, the tongue was red and dry, and the fauces were injected, but no patches were to be seen. The temperature on admission was 105.8°F, at 8 p.m. (half an hour before death) 107°F. The urine, which was drawn off by the catheter, contained no albumen, but she had diarrhoea, the motions being very watery, green, and offensive. Death was preceded by general convulsions.

RHEUMATISM.

Case No. 36. Ethel Cable, aged 21 years. Admitted into hospital on October 23rd, 1905, with the following history;- She was quite well up to October

20th, but on the following day felt feverish, and suffered from vomiting and sore-throat, and the rash appeared on the 22nd. On admission the rash was well developed upon the trunk and extremities, and of a bright red colour; the throat presented the typical enanthem, and there were small grayish patches on each tonsil. The submaxillary glands were enlarged, and the tongue showed the typical red strawberry condition. The temperature at 11.30 a.m. was 102.8°F, pulse 134, respirations 30, and the urine was free from albumen. On the morning of the 26th the temperature was normal, and the eruption had almost disappeared. The same afternoon she complained of headache, and pain in both ankles, which were found to be swollen. The temperature was 101°F, pulse 118, respirations 26.

October 27th. Both wrists are painful and swollen. Morning temperature 99°F, Evening 102°F. Desquamation first noticed on the neck.

October 28th. Joints about the same. Morning temperature 100°F; evening 102.4°F.

Her condition showed little change for the next two days, but on the 31st she felt a little easier, and on November 1st the pain had ceased. On November 3rd, she said she felt quite well, but although the joints were not painful, they were still a little swollen. After this the convalescence was uninterrupted, she was allowed up on November 13th and discharged on December 10th.

The temperature, more especially in the evening, presented a ladder-like appearance. The cardiac sounds were quite normal throughout the illness.

Case No. 37. Rheumatism and Mitral Valvular disease.

Luther Lane, aged 9 years, admitted into hospital on October 5th, 1905. His illness commenced on October 2nd, with vomiting sore-throat, and feverishness, the rash appearing the next day. On admission the temperature was 99.6°F, pulse 105, respirations 24, and the rash was only faintly marked. The tongue was atypical, there was only slight angina, and the submaxillary glands showed only slight enlargement. The cardiac sounds were normal, and no albumen could be detected in the urine. The attack was mild, and the patient progressed so favourably that he was allowed up on October 26th, but two days later he complained of pain in the right elbow and the right knee, which were also swollen. The

evening temperature was 100°F. Next day both ankles were red, painful, and swollen, and on the 30th both wrists were affected. The temperature showed a marked evening rise as compared with the morning, and the chart to all appearances looked very like one of pyaemia. The evening temperature was of a ladder-like description, but this was not so well-marked as in the preceding case. On November 2nd a well marked systolic murmur was heard at the mitral orifice. The patient did not show much alteration until November 9th, when all the joints were becoming smaller, and less painful, but at that time he complained of severe pains in the cervical muscles. On November 15th the patient was free from pain, but the joints remained slightly swollen for about one week longer. Desquamation ceased on November 27th, and he was discharged two days later, at the parents' request, though I should have detained him for a longer period owing to his weak state. The mitral systolic murmur was well marked on discharge. I heard from the Medical Attendant that he developed a severe attack of acute rheumatism, one month after discharge.

ADENITIS.

Case No. 38. Jane Jackson, aged 6 years, admitted into hospital on November 10th, 1905. The initial symptoms appeared on the 6th, and the rash next day. On admission the temperature was 99°F, pulse 92, respirations 24. The rash was hardly perceptible, there was no sore-throat, the tongue was atypical, and the urine was free from albumen. Desquamation was noticed on the cheeks on the 12th. She was allowed up on December 1st, and the convalescence was uninterrupted until December 13th, when the temperature rose to 99.8°F, in the morning, and an enlarged gland was noticed at each angle of the jaw, at the same time the urine contained a faint trace of albumen, which was more marked the following day (a well developed cloud). The glands were much enlarged, and tender on palpation, and although they became less painful and smaller on the 18th they did not reach their normal size for ten days later. The temperature became normal on the morning of the 19th, and the albumen remained about the same from the 15th to the 18th, but next day it was only a trace, and had disappeared on the 20th. She was discharged on January 10th, 1906

ALBUMINURIA.

Case No. 39. Constance Knowles, aged 3 years, admitted into hospital on November 21st, 1905, with the following history:- the initial symptoms - sickness, sore-throat, and feverishness - began on November 20th, the rash appearing next morning. On admission the temperature was 102.4°F, pulse 131, respirations 33. The throat was reddened, but showed no patches, the submaxillary glands were slightly enlarged, the tongue was the typical white strawberry, and a faint rash was to be seen upon the trunk and limbs. The urine did not contain albumen. The attack proved to be mild, desquamation was noticed on the face on the 25th, and the convalescence was favourable until the evening of December 9th, when the temperature rose to 99°F. The urine showed about one-sixth of albumen, and next morning there was oedema of the lower eyelids, and also about the knuckles, and on the dorsum of the feet. The albumen gradually diminished and on December 12th, only amounted to a trace, whilst the oedema had all disappeared by that date. On December 22nd the urine contained only a faint trace of albumen, and none on the 30th. She was discharged on January 6th, 1906.

Case No. 40. Albuminuria-Bronchitis. Mildred Pogmore, aged 4 years, admitted into hospital on December 4th, 1905. Her illness began on November 29th with sickness, sore-throat, and feverishness, and the rash appeared the next day. On admission the rash was only faintly discernible, the throat was slightly reddened, the tonsils were not swollen, and the tongue was atypical. The temperature was 103°F, pulse 140, respirations 34, and she had frequent cough. Moist sounds were to be heard over the whole of both lungs, and the urine contained about one-fifth of albumen. According to the history she frequently had attacks of bronchitis. The albumen was diminished to a trace on December 9th, a faint trace only on the 14th, and had disappeared on the 18th. The bronchitis improved under treatment, but the moist sounds never disappeared, and the breath sounds were somewhat harsh in character over the whole of both lungs. She was allowed up on December 25th, there were no more complications, and she was discharged on January 20th, 1906.

Case No. 41. Rheumatism-Albuminuria. Clarice Knowles, aged 7 years, admitted into hospital on November 18th 1905, with the following history:-the initial symptoms,- vomiting, sore-throat, and feverishness,- commenced on the morning of November 16th, the rash appearing the same evening. On admission the temperature was 102.2°F, pulse 118, respirations 28, the rash was well marked upon the trunk and extremities, the throat showed the typical enanthem, and although the tonsils were swollen, there were no patches. The tongue was the typical red strawberry, and the submaxillary glands were only slightly enlarged. The urine did not contain albumen. Desquamation was noticed on the cheeks on the 22nd, and the temperature was normal on the morning of the following day. On the afternoon of the 25th she complained of pain in the right elbow, and the evening temperature was 100°F. The joint was also red and swollen, and the next day both ankles were affected. The joints remained about the same until the 30th, when the pain was much easier, and finally disappeared on December 3rd. The swelling did not disappear until three days later. The cardiac sounds were normal. The temperature remained either normal or subnormal until the evening of the 12th when it rose to 99°F and the urine was found to contain about one-sixth of albumen. Next morning the temperature was 99.6°F, but only 98.6°F in the evening. She had well marked oedema of the lower eyelids, and also of the ankles, and during the 13th she only passed 10 ounces of urine. On the 14th the albumen had diminished to a trace, and the amount of urine excreted had increased to 30 ounces. On the 17th there was only a faint trace of albumen, and none on the 26th. The oedema had disappeared by the 18th. She was allowed up on January 1st, 1906, and discharged on the 6th.